OROVILLE DAM CITIZENS ADVISORY COMMISSION

Meeting 18
December 6, 2024

Hosted by the California Natural Resources Agency

CALIFORNIA NATURAL RESOURCES AGENCY

ITEM 1
WELCOME AND COMMISSION UPDATES

ROLL CALL

- Secretary of the California Natural Resources Agency
- California State Assembly
- California State Senate
- Director of the Department of Water Resources
- Director of the Office of Emergency Services
- Director of the Department of Parks and Recreation
- Commander of the CHP Butte County Field Division
- City of Oroville Appointees
- County of Butte Appointees
- County of Sutter Appointees
- County of Yuba Appointees
- Butte County Sheriff Appointee
- Sutter County Sheriff Appointee
- Yuba County Sheriff Appointee

ACTION ITEM TRACKER

OPENING REMARKS CONTINUED

ITEM 2

WINTER OUTLOOK & OPERATIONS

Forecasting the Water Year

- Fall (October/November)
  - Precipitation Onset
  - Temperature: Anomalous, Extreme or Record-Setting
  - Soil Moisture State with Snowpack Initiation
- Winter (December/January/February)
  - Wet/Dry
  - Notable Anomalies
- Spring (March/April/May)
  - Late-Season Bailout or Early Shutoff?
  - Peak Snowpack Timing and Magnitude
- Summer (June/July/August/September)
  - Drying Timing, Pace and Scale
  - Extreme Heat Events
  - Tropical Activity
- Multi-Year Prediction – What about next year?

Climate Change: How much different will the next decade be?

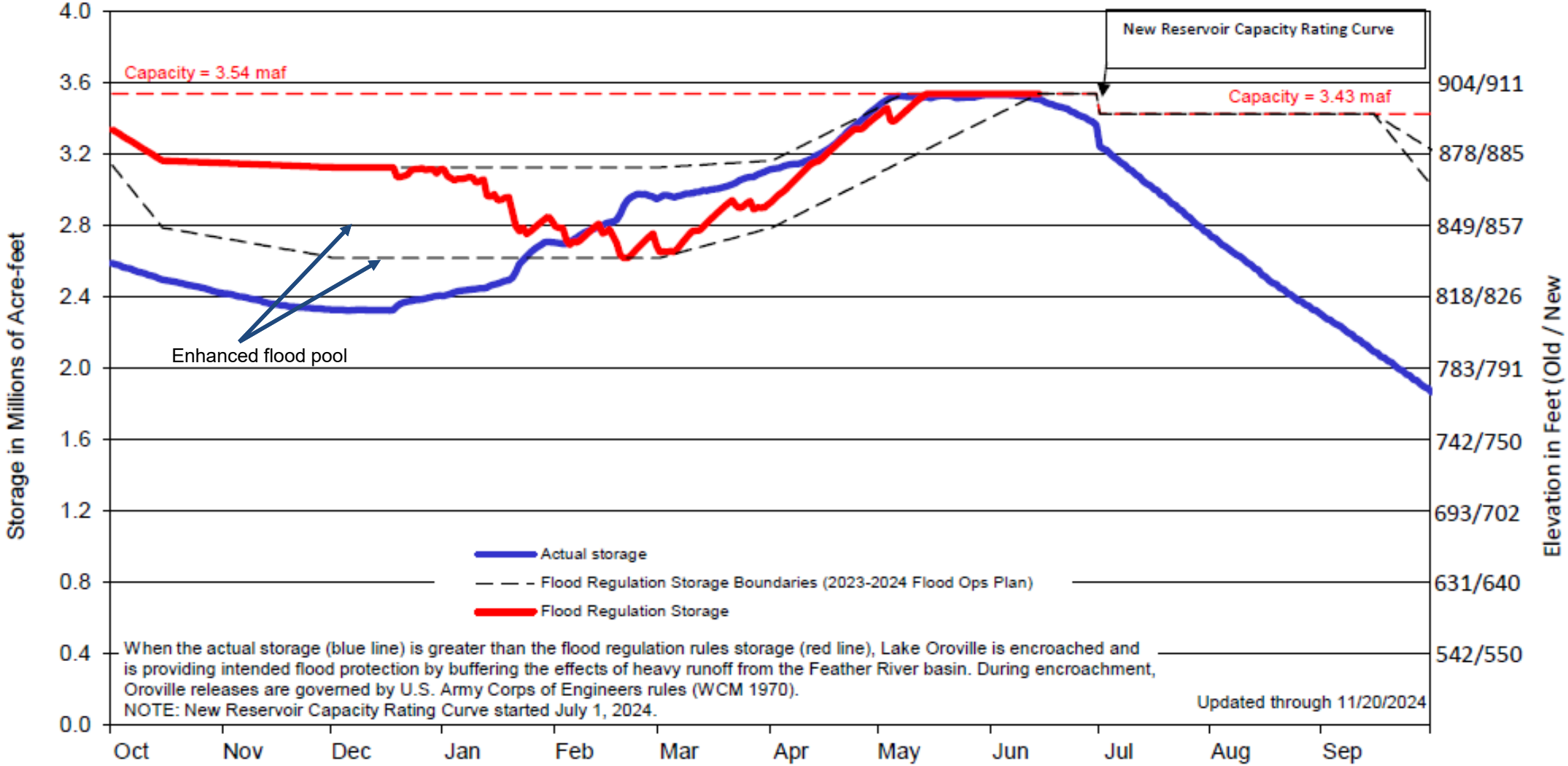
Lake Oroville 2024/2025 Winter Operations and Planning

Oroville Citizen's Advisory Commission Meeting

Molly White, O&M Assistant Division Manager, Water Management

Lake Oroville Storage

October 1, 2023 to September 30, 2024



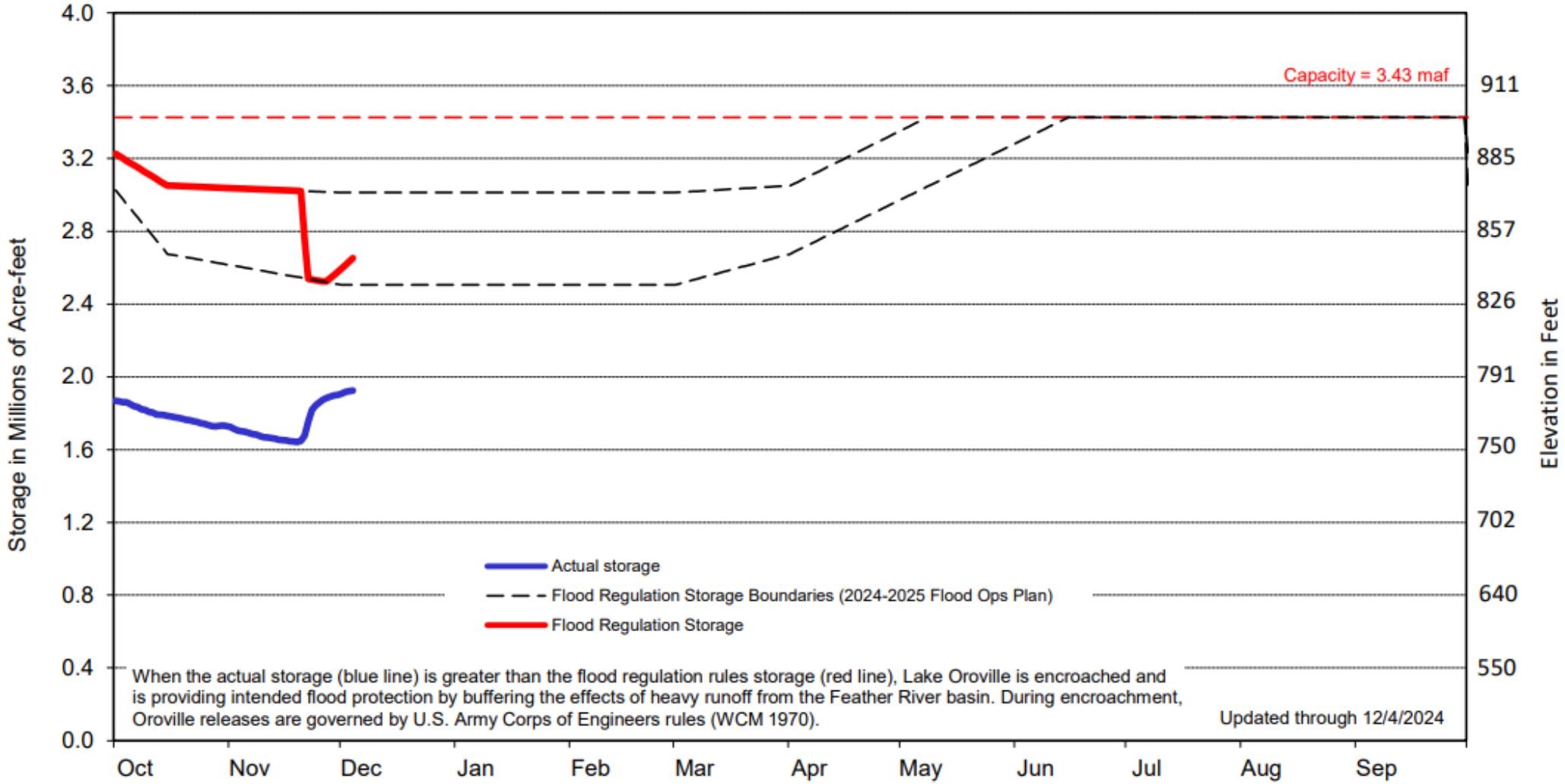
When the actual storage (blue line) is greater than the flood regulation rules storage (red line), Lake Oroville is encroached and is providing intended flood protection by buffering the effects of heavy runoff from the Feather River basin. During encroachment, Oroville releases are governed by U.S. Army Corps of Engineers rules (WCM 1970).

NOTE: New Reservoir Capacity Rating Curve started July 1, 2024.

Updated through 11/20/2024

Lake Oroville Storage

October 1, 2024 to September 30, 2025

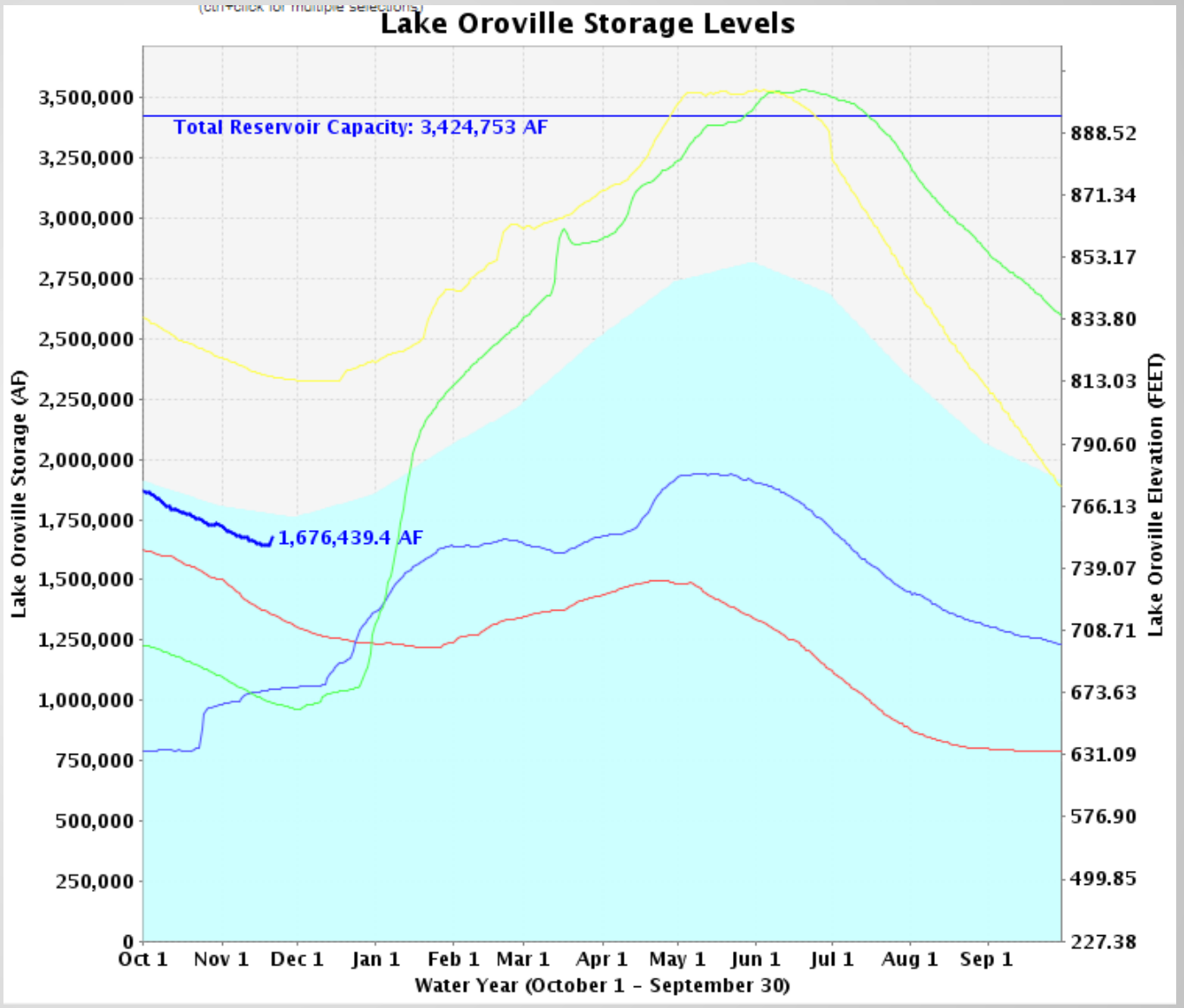


Current Conditions

Storage: 1.7 MAF

95% historical average

- Began with below average precipitation and extreme heat events
- November – above avg precipitation



CALIFORNIA DEPARTMENT OF WATER RESOURCES

Planning for 2025

- Average conditions to date
- Continue to plan and prepare for extreme wet or dry conditions
- Current releases at minimum required (1,750 cfs) to conserve storage
- Will continue to implement the enhanced flood pool

Questions?

ITEM 3

OROVILLE EMERGENCY RESPONSE EXERCISE

SWP Emergency Preparedness Program and the 2024 Oroville Dam Exercises

Oroville Dam Citizens Advisory Commission

Introduction

SWP EPP Program Vision

Building a resilient SWP through a culture of preparedness that supports and maintains a State of Readiness.

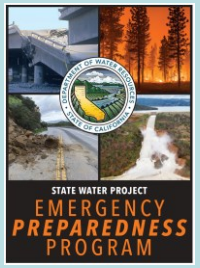
Guiding Principles

Consistency. Program activities foster a shared understanding of emergency preparedness supported through standardization and integration of effort.

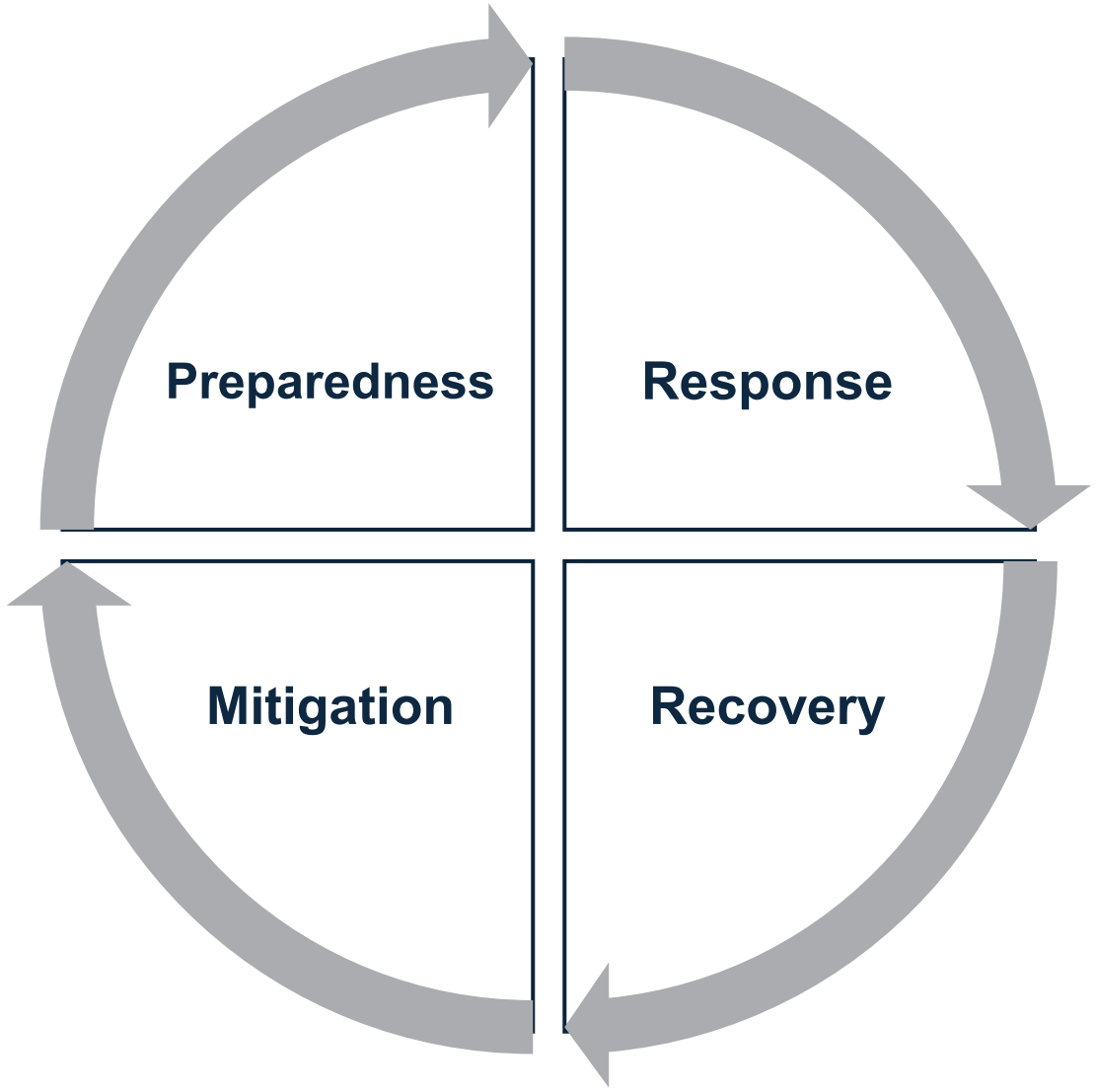
Sustainability. Program activities are memorialized through policy and are prioritized through dedication of organizational, human, and financial resources both now and in the future.

Proactivity. Program activities are driven by a risk-informed strategy that aligns with DWR priorities and is adaptive to change.

Coordination. Program activities are aligned internally and externally to maximize the potential of shared resources and partnerships.



Phases of Emergency Management



STATE WATER PROJECT
EMERGENCY PREPAREDNESS PROGRAM

Overview of Trainings and Exercises

Levels of exercises/training:

- Seminar
- Workshop
- Tabletop Exercise (TTX)
- Functional Exercise (FX)
- Full-Scale Exercise

Oroville Dam Exercises:

Tabletop Exercise
August 7 ,2024

Functional Exercise
August 28 ,2024

Oroville Dam Functional Exercise Overview

Goals of the Exercise:

- Strengthen relationships
  - Within DWR
  - With External Agencies
- Identify opportunities for shared action.
- Identify improvements.

STATE WATER PROJECT
EMERGENCY PREPAREDNESS PROGRAM

Oroville Dam Functional Exercise Participants

129
Total FX Attendees

Internal to DWR:

- OFD ICT
- SWP EOC
- DOC
- FOC
- DSOD

External Agencies:

FEDERAL / INTERNATIONAL

- Department of Homeland Security
- Federal Energy Regulatory Commission
- National Weather Service
- National Oceanic and Atmospheric Administration
- United States Army Crops of Engineers
- Ministry for the Ecological Transition and the Demographic Challenge (International)

STATE

- California Department of Fish and Wildlife
- **California Governor's Office of Emergency Services**
- **California Department of Parks and Recreation**
- California Department of Transportation
- **California Highway Patrol**

LOCAL

- **Butte County**
- City of Gridley
- **City of Oroville**
- PG&E
- South Feather Water and Power
- **Sutter County**
- Yuba City
- **Yuba County**
- Yuba Water
- California Water Service

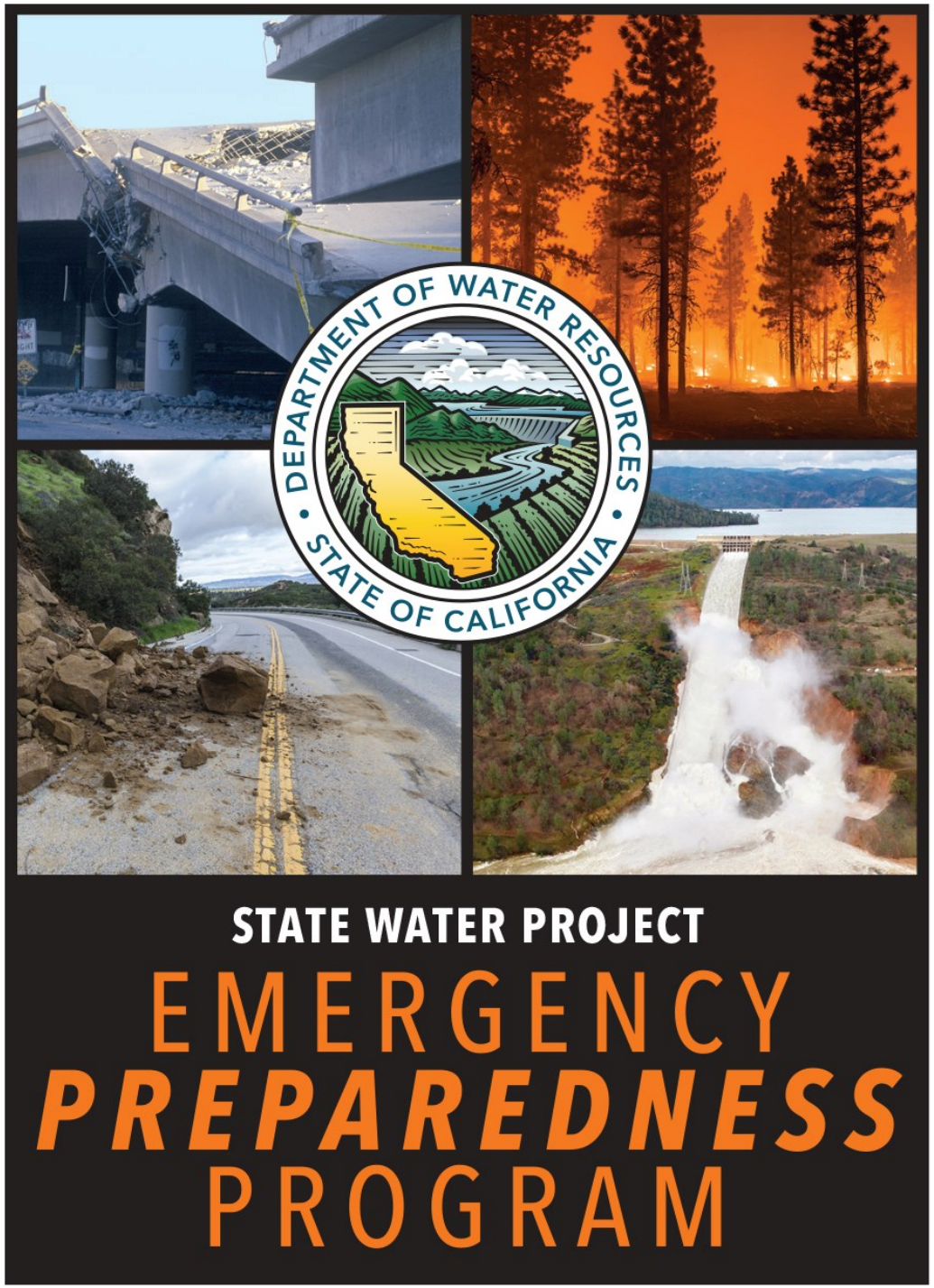
Blue Text =
OCAC Member

STATE WATER PROJECT
EMERGENCY PREPAREDNESS PROGRAM

Key Take Aways

- Continue internal trainings with inclusion of external partners
- Increase frequency of exercises
- Improve Cooperator Meetings

STATE WATER PROJECT
EMERGENCY PREPAREDNESS PROGRAM



Questions and Comments?

ITEM 4

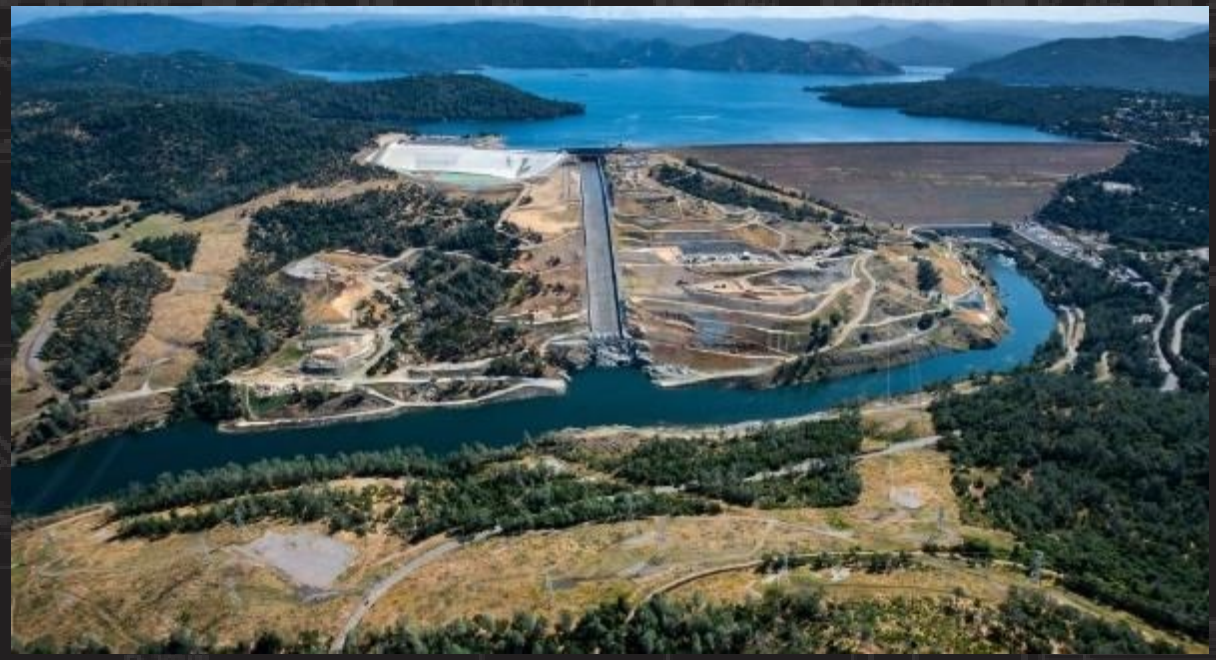
WATER CONTROL MANUAL UPDATE

NEW BULLARDS BAR DAM - OROVILLE DAM WCM UPDATES

Jenny Fromm, P.E.
Chief, Water Management
Sacramento District

Oroville Citizens Advisory Committee Meeting

Date: 06 DEC 2024



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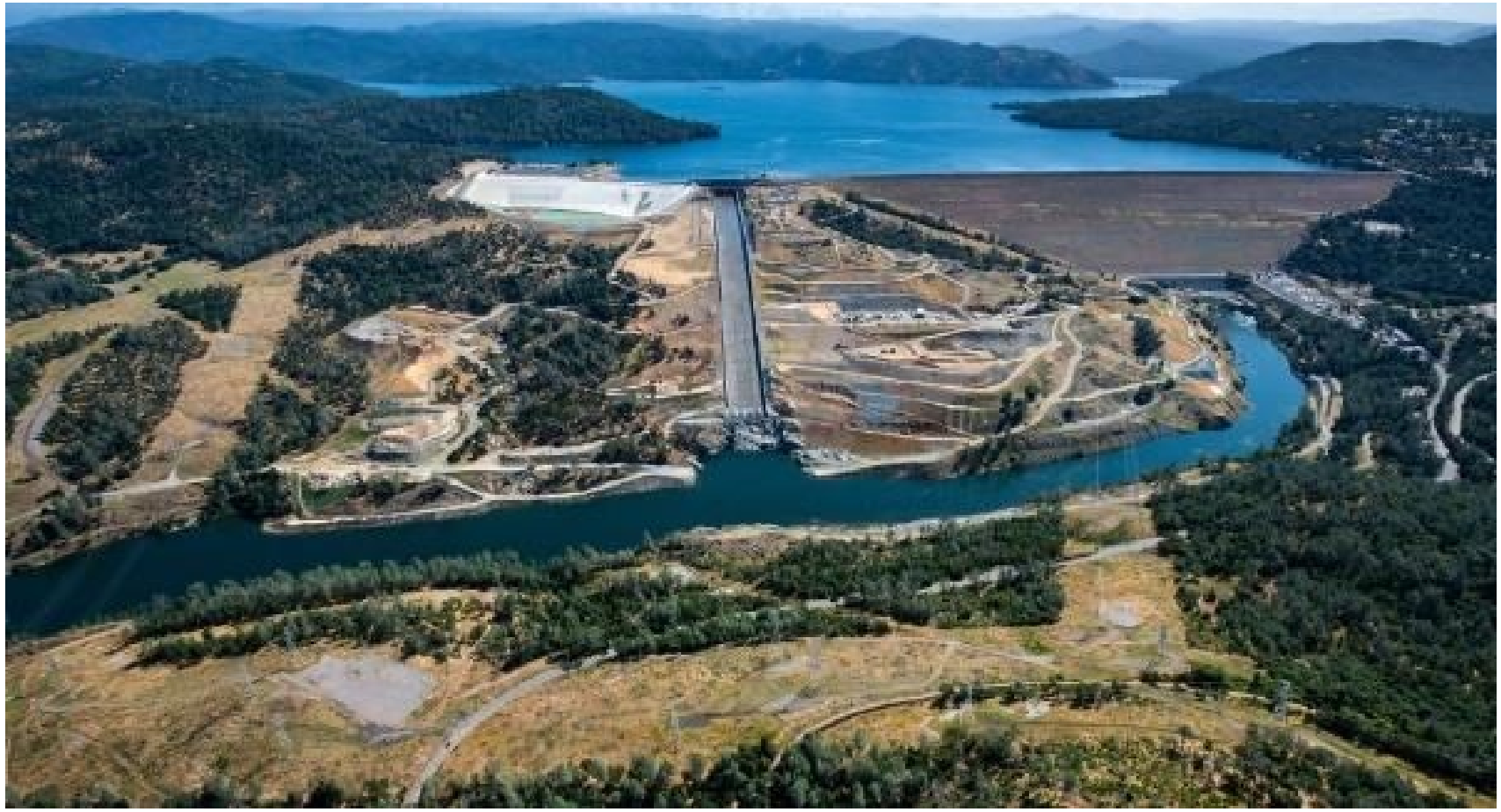
AGENDA

- Water Control Manual Overview
- FIRO Pilot Study
- Simplified WCM Update Process
- Next Steps
- Questions



01 Water Control Manual Overview

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USACE WATER MANAGEMENT

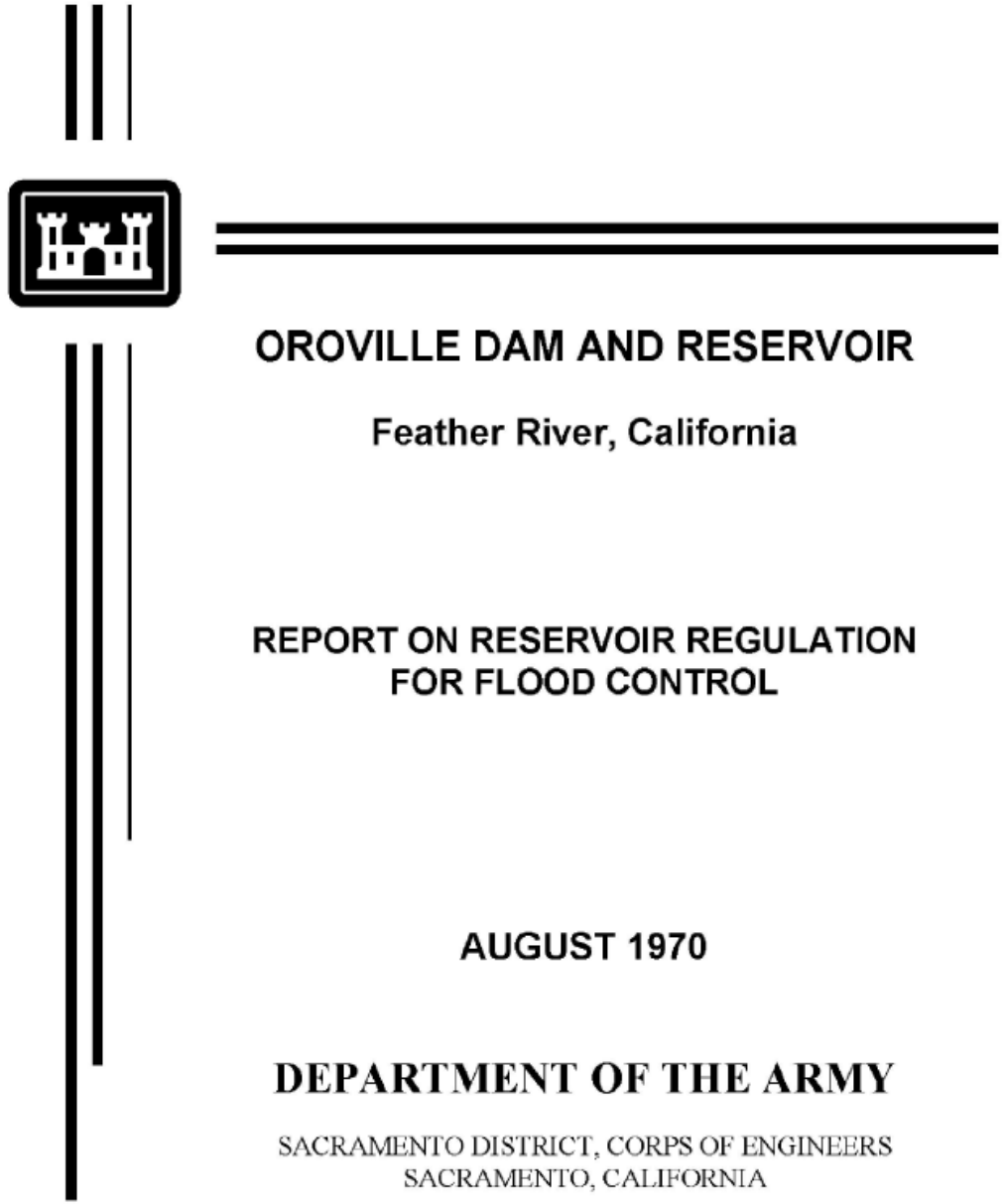
Basic objectives of water control management

- Operate to authorized purposes and laws
- Maintain structural and operational integrity
- Avoid risk to public health and safety, life, and property

USACE is responsible for water control management at USACE-owned projects

USACE is also responsible for prescribing flood control and navigation regulations and guidance at non-USACE projects

- Dams owned and operated in non-flood space by other entity
- Special acts of Congress
- FERC conditions
- Other agreements



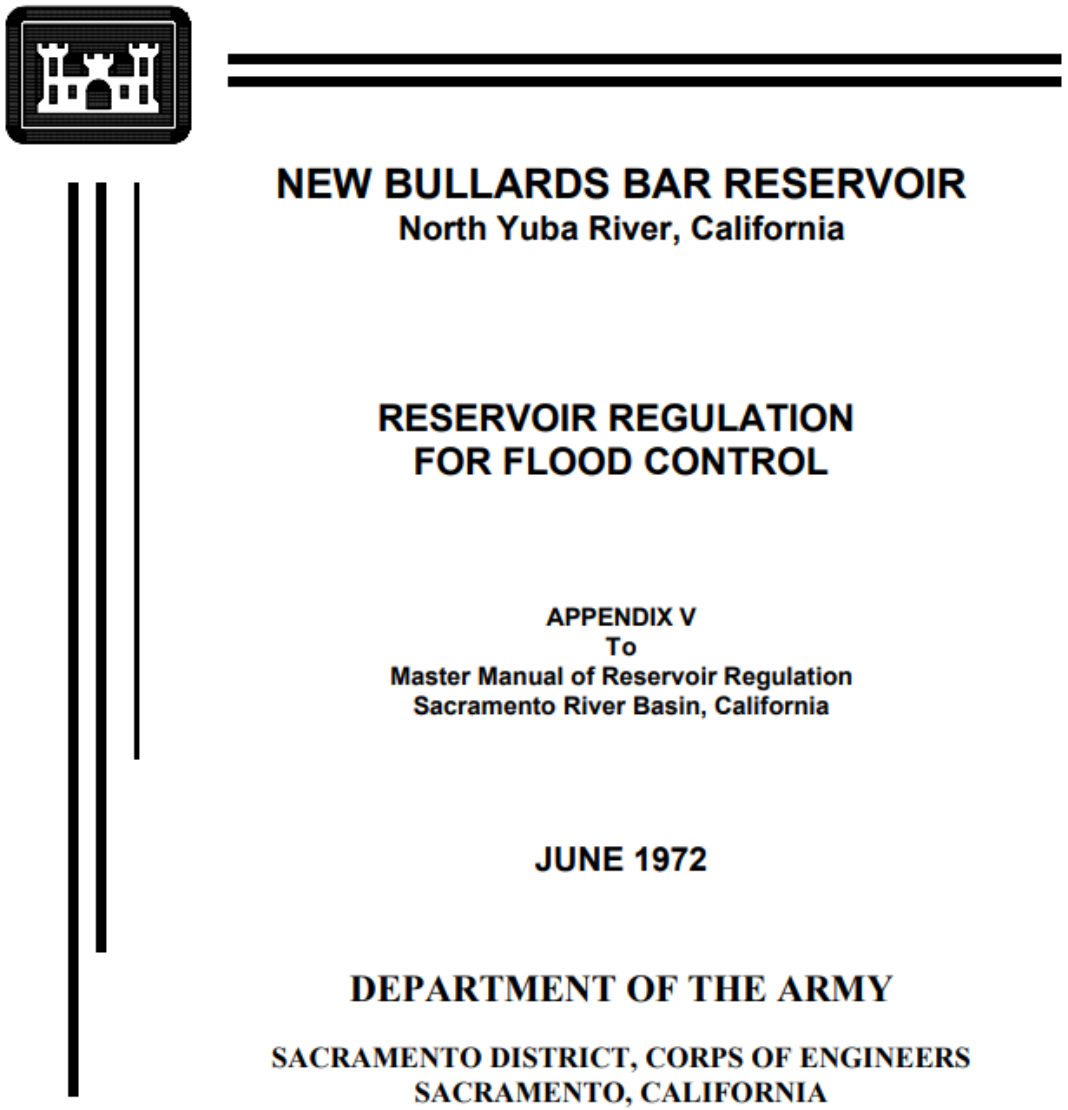
WCM TERMINOLOGY

A water control manual includes

- Description and history of the project
- Information about the watershed
- **Water control plan** (operations plan)

The water control plan describes how the project is to be operated to meet its authorized purposes

– Graphical representation of WCP is the water control diagram
– The water control diagram shows the flood control space and release requirements, based on the time of year and state of the watershed



NEW BULLARDS BAR RESERVOIR
North Yuba River, California

RESERVOIR REGULATION
FOR FLOOD CONTROL

APPENDIX V
To
Master Manual of Reservoir Regulation
Sacramento River Basin, California

JUNE 1972

DEPARTMENT OF THE ARMY

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

WCM UPDATE JUSTIFICATION

Water control manual should be reviewed regularly and updated when information is outdated

- Administrative
  - Points of contact
  - Activity/developments in watershed
  - Hydrologic data to add to period-of-record analyses
  - Updates to USACE standards
- Comprehensive
  - Revisions to water control plan

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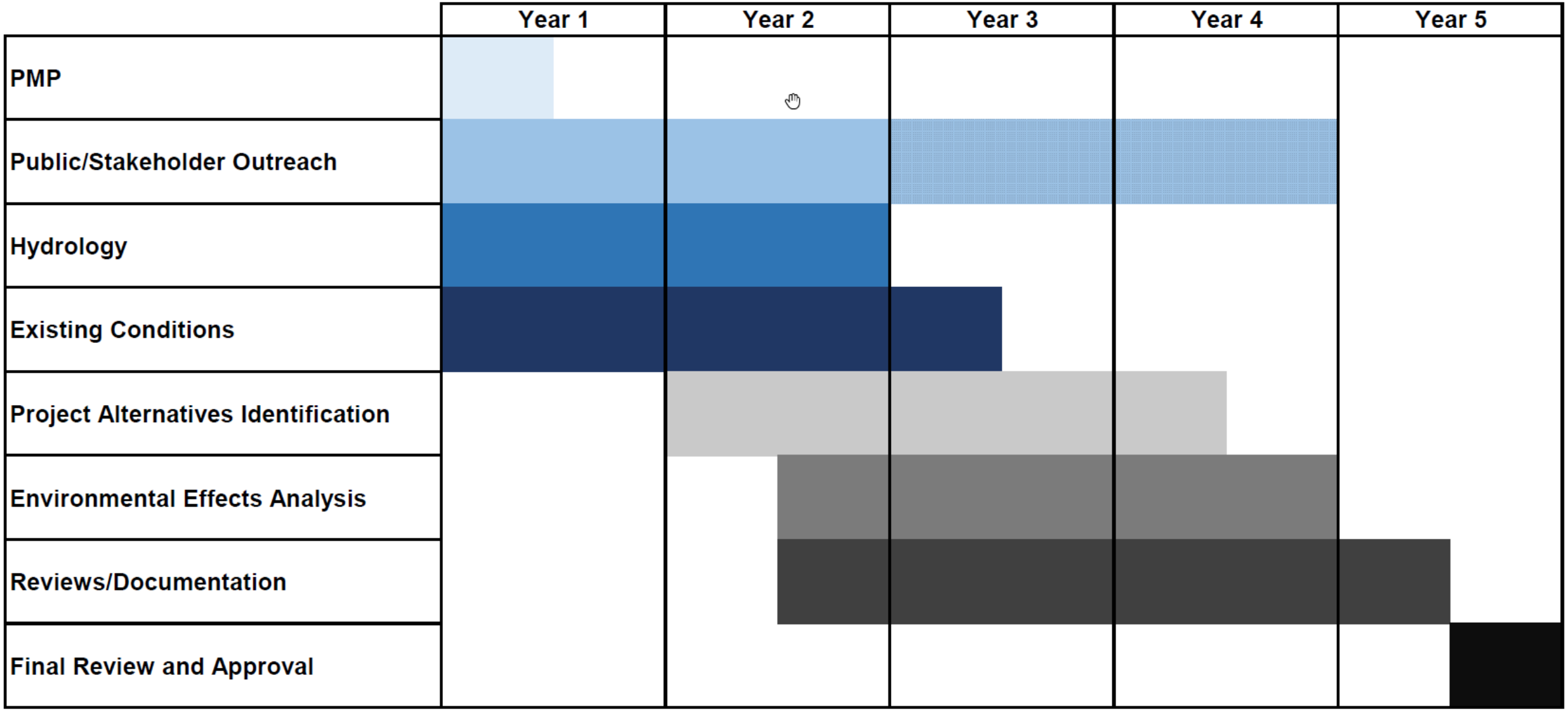
SIMPLIFIED WCM UPDATE PROCESS



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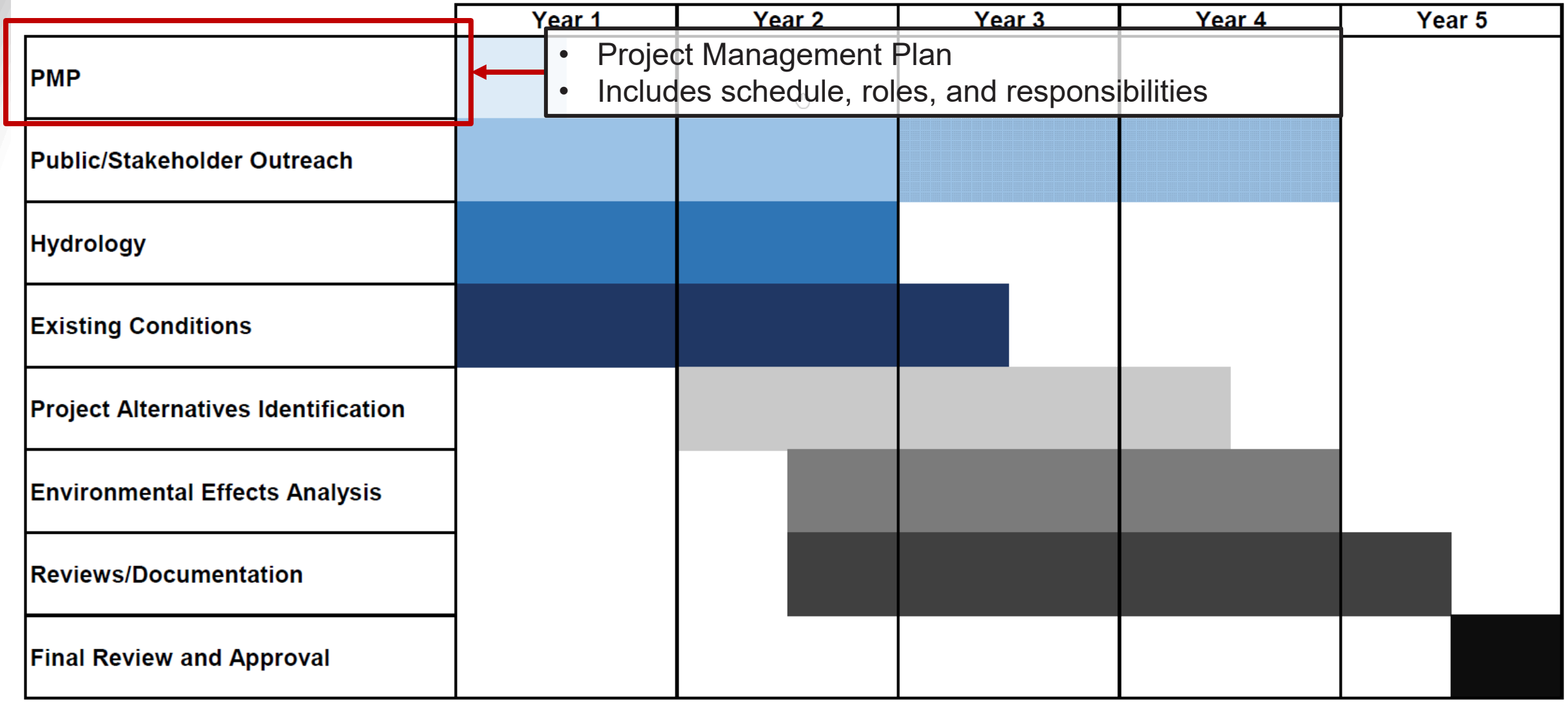
SIMPLIFIED WCM UPDATE PROCESS



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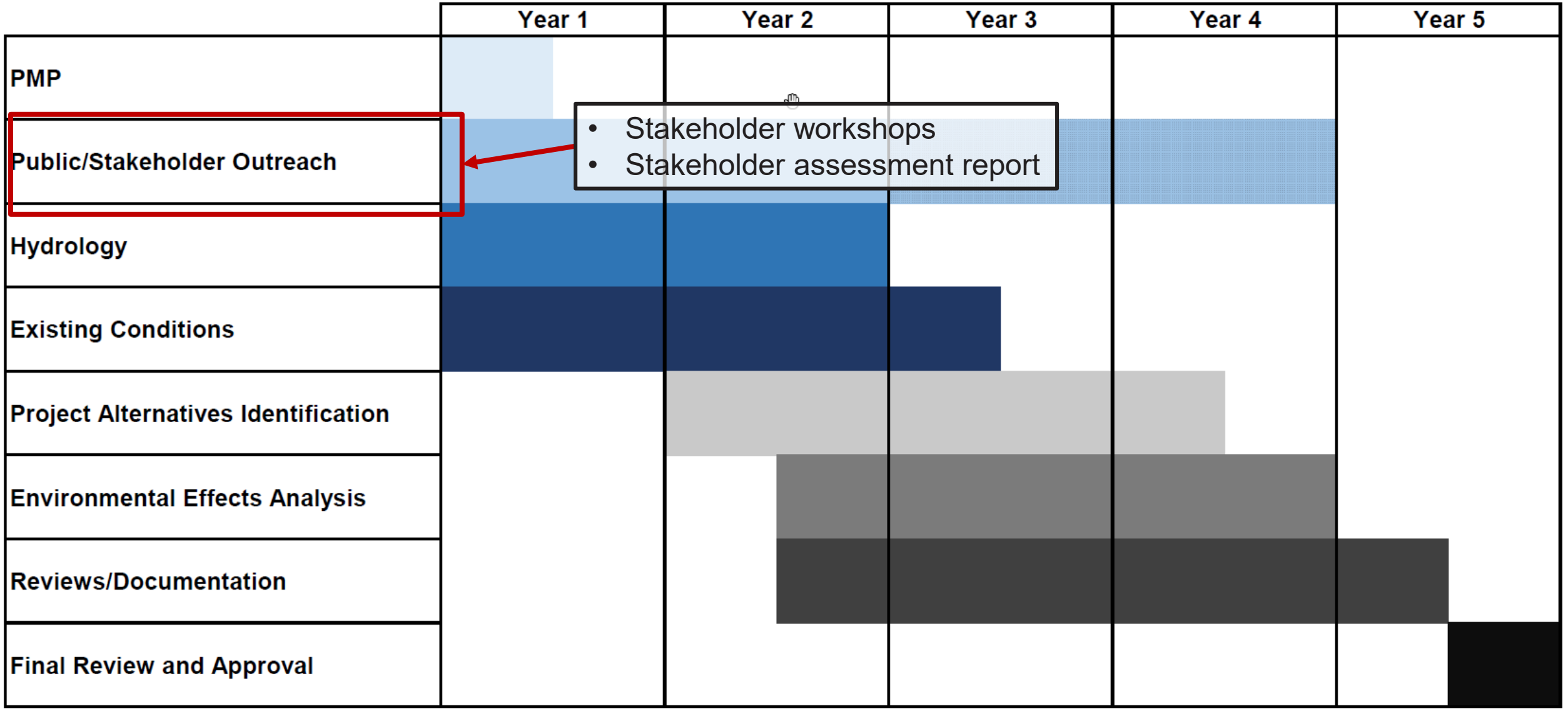
SIMPLIFIED WCM UPDATE PROCESS



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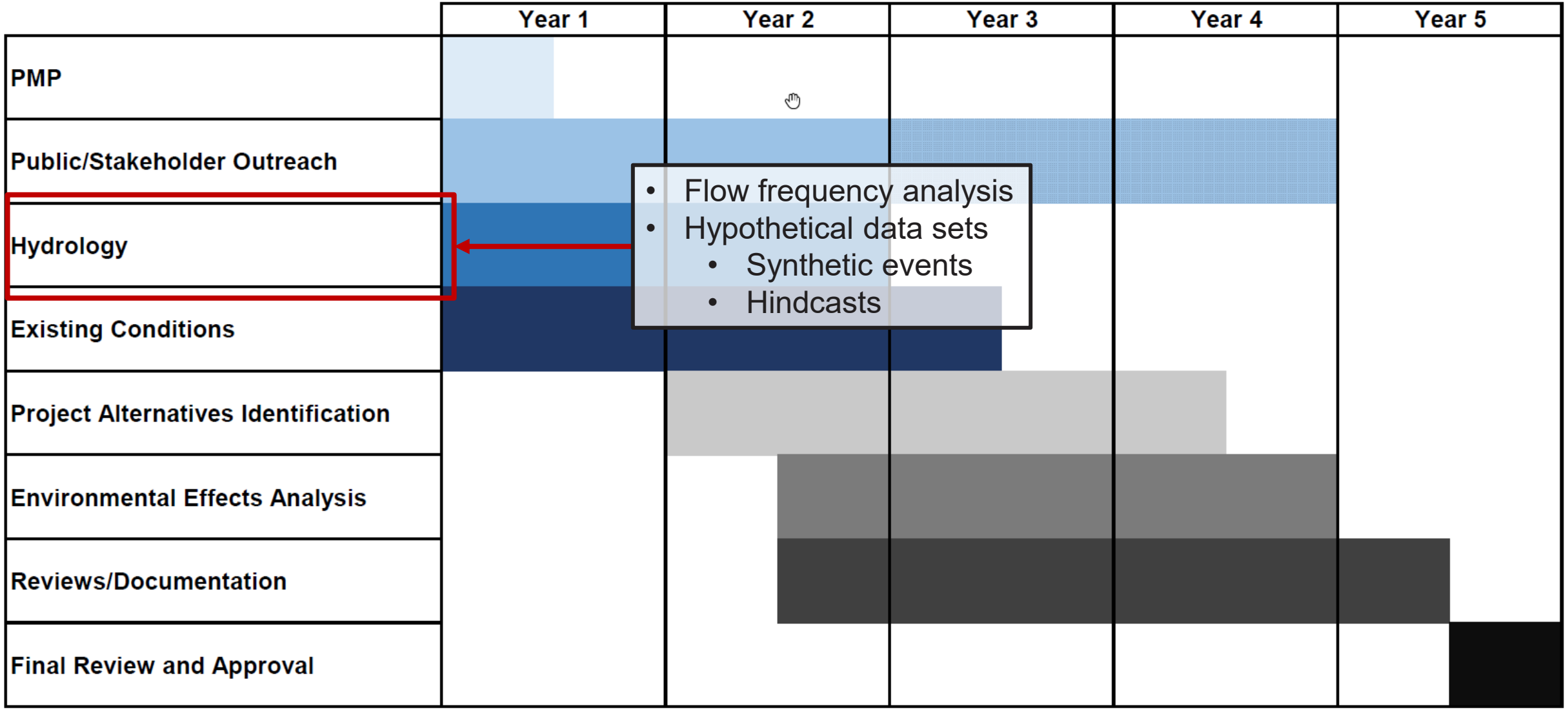

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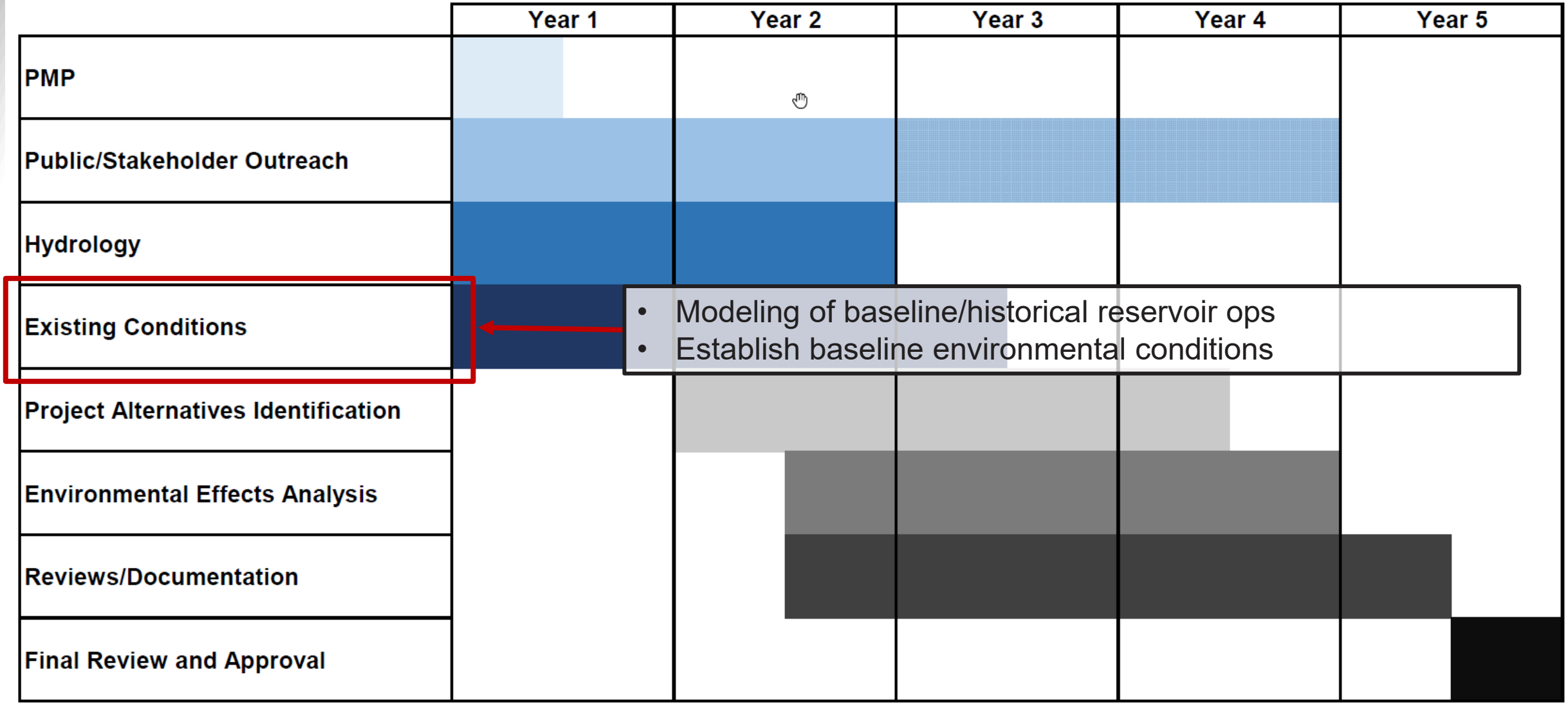

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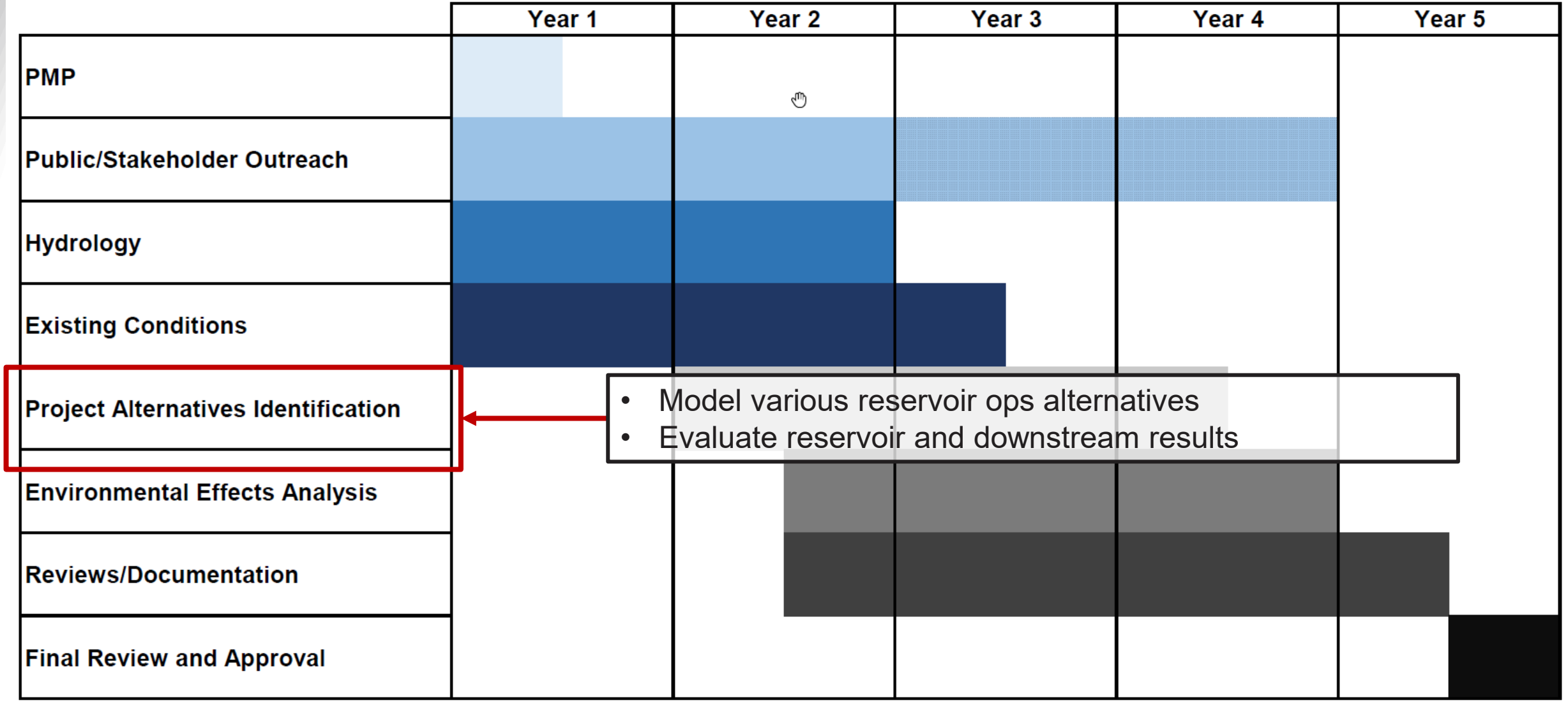

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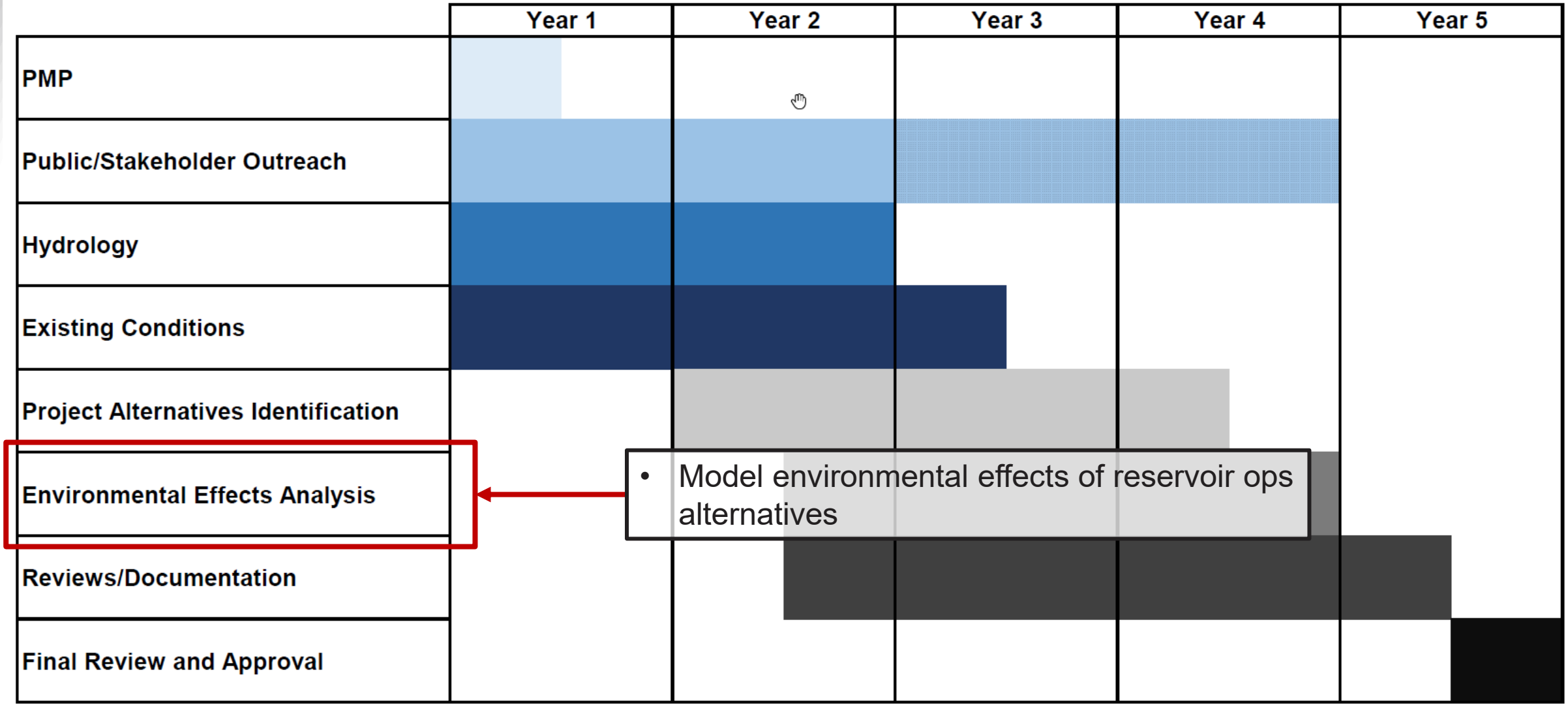

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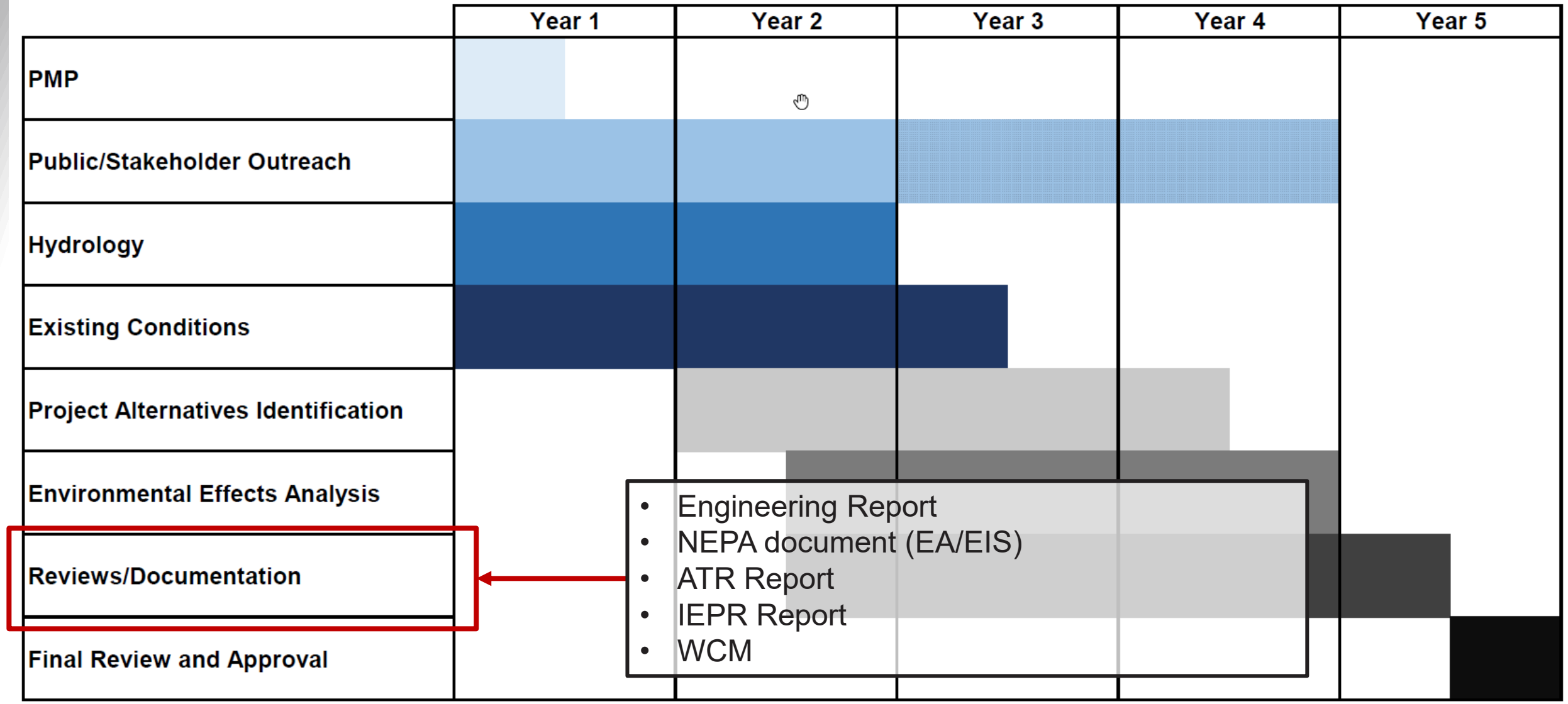

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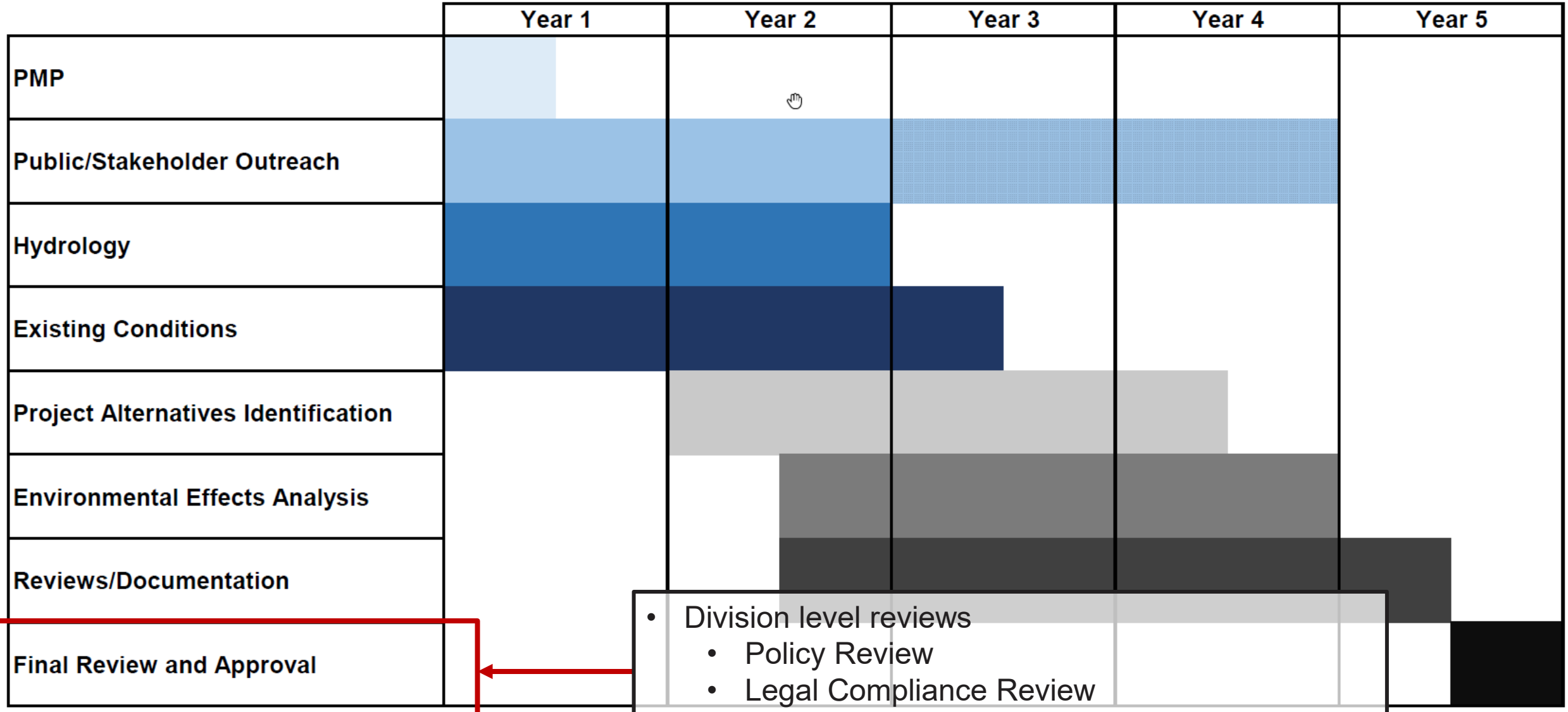
SIMPLIFIED WCM UPDATE PROCESS



- Division level reviews
  - Policy Review
  - Legal Compliance Review
- Approved by Division Commander

02 FIRO Pilot Study

FORECAST INFORMED RESERVOIR OPERATIONS (FIRO)

FIRO Definition:
*A reservoir operations strategy that better informs decisions to retain or release water by integrating **additional flexibility** in operation policies and rules with enhanced monitoring and improved weather and hydrological forecasts*

With FIRO, forecast information can be used to compute:
1. The amount of space to keep empty to prepare for future inflows, and
2. The magnitude of releases that are needed (or not needed) when encroached in this space.

Goals of FIRO are to **improve flood risk management and increase water conservation**

YUBA-FEATHER FIRO PILOT PROGRAM

Yuba Water Agency and DWR are working with the U.C. San Diego, Scripps Institution of Oceanography, Center for Western Water and Weather Extremes (CW3E) to evaluate the viability of FIRO in the Yuba-Feather System.

This parallel research effort is being coordinated with the Oroville and New Bullards Bar WCM Updates. More information is available on the CW3E website: https://cw3e.ucsd.edu/firo_yuba_feather

02 Simplified WCM Update Process

STATUS OF ENVIRONMENTAL TASKS FOR WCM UPDATES

You are here →

1. Environmental Compliance Management Plan	✓
2. Environmental Modeling Plan	✓
3. Develop No-Action and Future without Project base condition	✓
4. Modeling to support initial environmental analyses and alternatives screening	◷
5. NEPA Scoping and Initial Stakeholder Coordination	○
6. Draft WCM Document	○
7. Draft NEPA Document	○
8. Public Draft Review	○
9. Final NEPA Document and WCM Update	○
10. USACE Approval and Record of Decision	○

✓ Completed ◷ In Progress ○ Not Started

03 Next Steps

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NEXT STEPS: NEPA PROCESS AND TIMELINE

Public Scoping Period
- Spring 2025

Draft WCM Update/Draft NEPA Document
- December 2025

Public Review Period
- EA – 30 days
- EIS – 45 days

Final NEPA Document
- TBD

- **NEPA Lead Agency**: *USACE, Sacramento District*
- **Cooperating Agencies**: *TBD*
- **CEQA:** *Not expected*

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FOR ADDITIONAL INFORMATION

For additional information on the New Bullards Bar and Oroville Dams Water Control Manual Updates, visit the project web page by using this QR code.

Email us questions or comments at
NBB-Oroville-WCMupdates@usace.army.mil

ITEM 5

HOW THE WATER CONTROL MANUAL RELATES TO PUBLIC SAFETY DOWNSTREAM

Commissioner-led presentation on how the Water Control Manual relates to public safety, including perspectives on public safety-focused objectives for the update

Robert Bateman, Commissioner
Oroville Dam Citizens Advisory Commission

Matt Mentink, Member
Oroville Dam Comprehensive Needs Assessment
Ad Hoc Group

Presented on behalf of the Feather River Recovery Alliance

WHY DOWNSTREAM SAFTETY MUST BE REPRESENTED IN WCM REVISION PROCESS

- Water has long been a divisive issue in the Central Valley
- Regulation must reflect balance between safety and water delivery
- Water Control Manual (WCM) has failed us in the past partly because it was designed primarily for water delivery
- The state water contractors have power and influence.
- Public safety must be strongly represented by united community interests
- Water delivery is important but safety must be priority

Presented on behalf of the Feather River Recovery Alliance

WHO ARE WE AND HOW HAVE WE BEEN REPRESENTING DOWNSTREAM SAFETY

- Butte County affiliated Feather River Recovery Alliance
  www.notjustaspillway.com

- 2017 petition to FERC to 'hold the DWR accountable' signed by 6,500

- Allies and advisors include:
  - CNA Ad Hoc Group members
  - City of Oroville, Oroville Recreation Committee, Feather River Recreation and Park District, and other Oroville agencies
  - OCAC commissioners
  - UC Berkeley Center of Catastrophic Risk Management
  - Local state elected representatives

Presented on behalf of the Feather River Recovery Alliance

WHO ARE WE AND HOW HAVE WE BEEN REPRESENTING DOWNSTREAM SAFETY

- Working with the US Army Corps of Engineers on WCM
  - Questions submitted November 2023 answered in February
  - Concerns and recommendations submitted in August

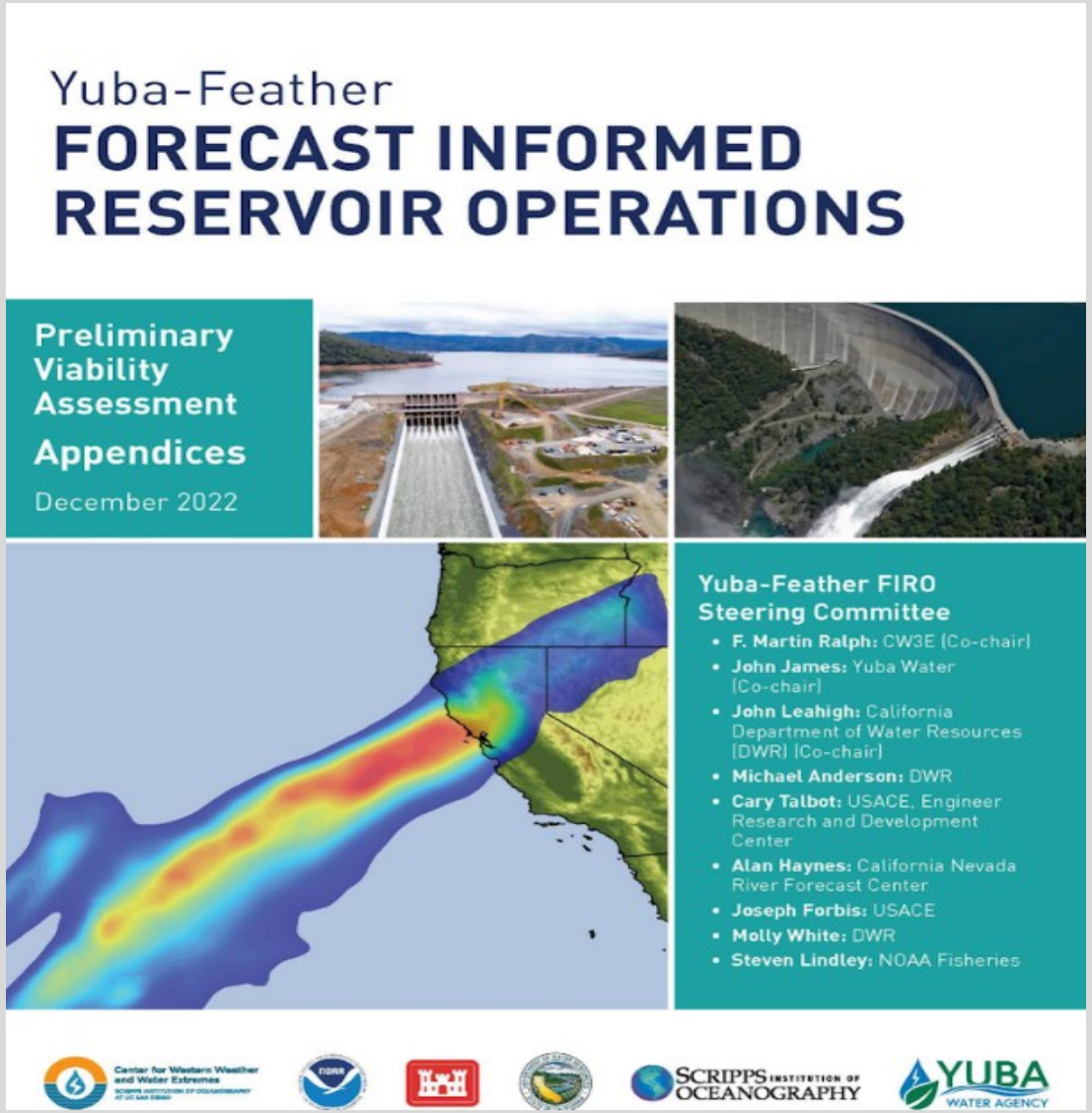
- Meetings with DWR under the auspices of the OCAC

- Lessons learned from 1997 Flood
  - Understanding FIRO
  - Appreciation of DWR's WCM objectives

Presented on behalf of the Feather River Recovery Alliance

YUBA-FEATHER FORECAST INFORMED RESERVOIR OPERATIONS (FIRO)

Preliminary Viability Assessment Report



Presented by Matt Mentink, Oroville Comprehensive Needs Assessment, Ad hoc Member, on behalf of the Feather River Recovery Alliance

YUBA-FEATHER FORECAST INFORMED RESERVOIR OPERATIONS (FIRO)

Introduction

Section 1— Introduction

1.1 Project Purpose and Objective

The Yuba-Feather watersheds (see Figure 1-1) has a long history of catastrophic floods. Since 1950, five major floods have resulted in 41 deaths, significant property damage, and devastating social and economic impacts. In response, Yuba Water Agency, which owns and operates New Bullards Bar Reservoir, and the California Department of Water Resources (DWR), which owns and operates Lake Oroville, are working with the UC San Diego Scripps Institution of Oceanography, Center for Western Weather and Water Extremes (CW3E); the U.S Army Corps of Engineers (USACE); and the National Oceanic and Atmospheric Administration (NOAA) to assess Forecast Informed Reservoir Operations (FIRO). FIRO leverages scientific improvements in forecasting of atmospheric rivers (ARs), which are responsible for more than 90 percent of the flood damages in this region, to anticipate and better manage large storm events. The primary objective of this FIRO project is to reduce flood risk; a secondary objective is to achieve incidental water supply benefits where possible.

Figure 1-1. Yuba-Feather watersheds.

This project will assess how improved precipitation and runoff forecasts during large storm events can reduce flood risk by strategically integrating these forecasts into reservoir operations. The primary risk reduction method is potential pre-releases to evacuate water from the conservation pool ahead of large

- Flood history since 1950
- 5 major floods resulted in 41 deaths, significant property damage, and devasting social and economic impacts

Primary Objectives:

- Reduce flood risk
- Achieve incidental water supply benefits where possible

Presented on behalf of the Feather River Recovery Alliance

YUBA-FEATHER FORECAST INFORMED RESERVOIR OPERATIONS (FIRO)

FIRO Objectives

The planned but unconstructed Marysville Reservoir was designed to prevent flows from exceeding 300,000 cubic feet per second on the Feather River downstream of the Feather-Yuba confluence for a standard project flood (SPF). The Yuba-Feather FIRO project will analyze if enhanced observation and forecast information can enable NBB and ORO operational strategies to provide a "functional equivalent" of up to 260,000 ac-ft of space without reallocating water supply for flood space. This "functional equivalent" could be feasible through pre-releases of water before major floods.

As an example, existing studies inform how the "functional equivalent" of up to 260,000 ac-ft could potentially be achieved. In April 2020, Yuba Water conducted a reservoir operations study to document the magnitude of potential pre-releases using forecasts to inform the reservoir operations with a proposed secondary spillway for an epic flood event, like the 1997 flood. The study indicates that, with three days of pre-releases, it is possible to evacuate 87,000 ac-ft of water from NBB before the storm.

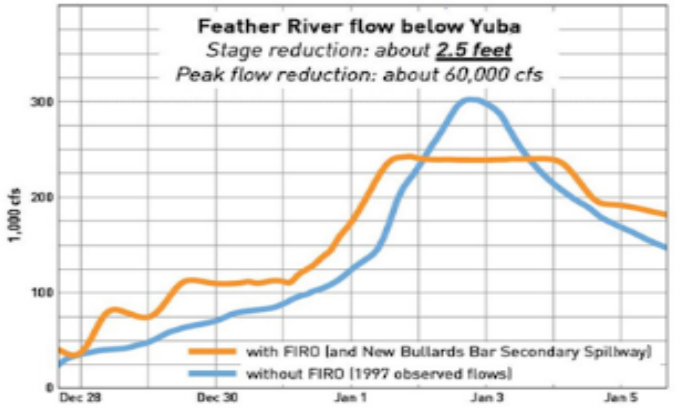


Figure 1-3. Hypothetical flood reduction with FIRO. Credit: Yuba Water.

Another example of "functional equivalency" could be achieved with respect to the use of the emergency spillway at ORO. The current USACE WCM for ORO provides routing of the SPF under various scenarios, some that assume construction of the Marysville Dam and some that do not. Without the Marysville Dam, activation of the emergency spillway is necessary under some flood routings in order to manage the SPF without exceeding downstream flow objectives. With Marysville Dam in place, activating the emergency spillway would not be necessary in managing the SPF. A demonstration of "functional equivalency" could therefore be achieved if new capabilities associated with FIRO, including proactive release of storage in advance of a major storm event at both ORO Dam and NBB Dam, could preclude the need for activating the emergency spillway even without the Marysville dam when managing a SPF scale event.

As an alternative to functional flood control space, "functional equivalency" could also be defined in terms of other flood performance metrics, such as downstream flood flow frequency, magnitude, and duration. Yuba-Feather FIRO will assess the viability of using improved inflow forecasts along with pre-releases to regain flood operation performance that would have been achieved with the Marysville Reservoir flood pool. The 260,000 ac-ft "functional equivalent" target value will be a useful goal in analyzing alternatives to support the Yuba-Feather FIRO primary objective of flood risk reduction.

Recognizing drought impacts on water supply, FIRO will secondarily explore whether some ancillary water supply benefits may also be realized. If no storms are forecasted during the late

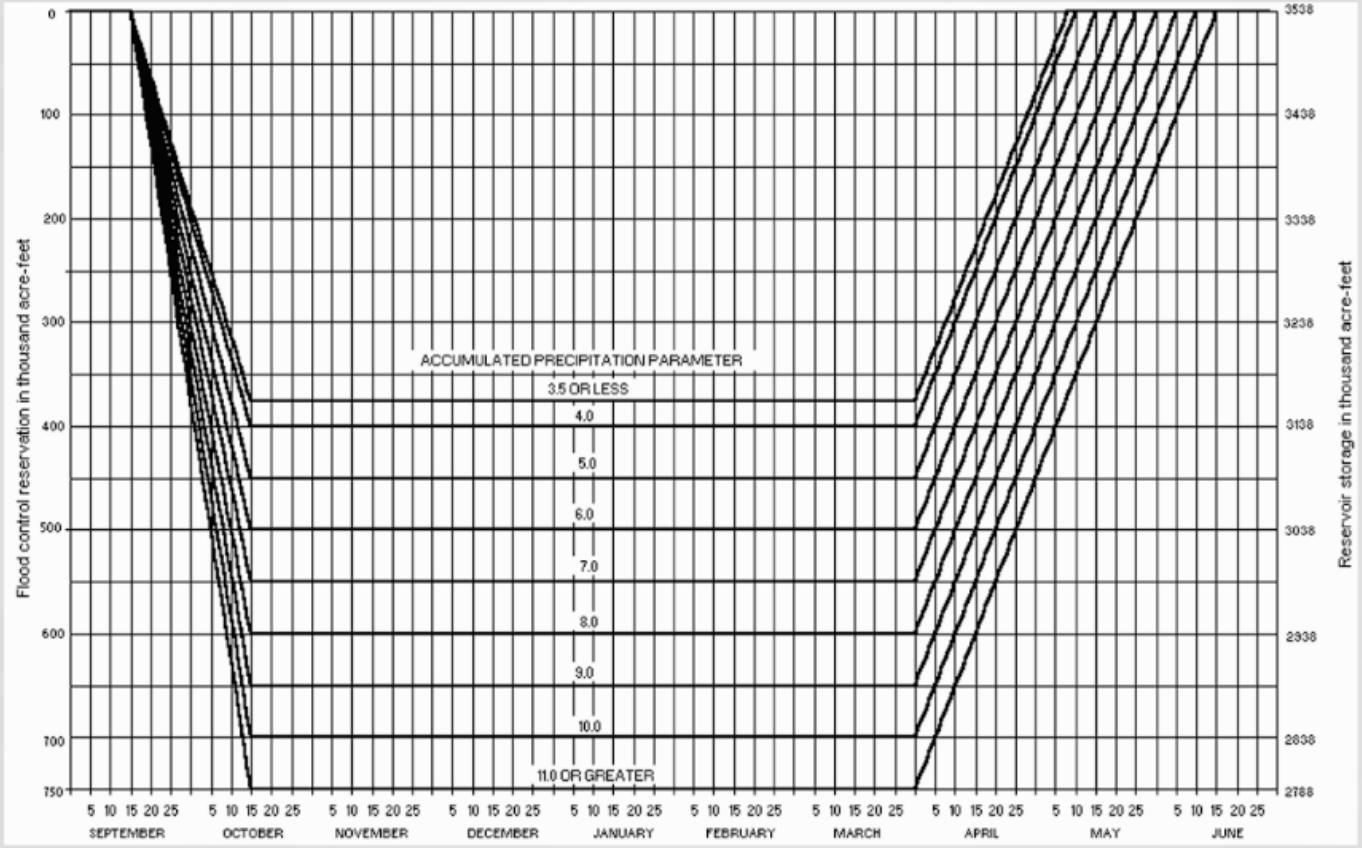
Unconstructed Marysville reservoir add 260,000 AF of flood storage to prevent downstream flow exceedance for the standard project flood.

The functional equivalency of 260,000 AF storage could:

- Avoid use of emergency spillway
- Reduce flood flow frequency

OROVILLE VARIABLE FLOOD POOL 375–750K AF
Soil Wetness Index

USACE 1970 Flood Pool



- Goal of achieving end of season water storage
- Soil wetness does not consider snow melt in sizing the flood pool

Alt 1	Baseline	750K AF	100%
Alt 2	EFO8	178K AF	24%
Alt 3	EFO Hybrid	467KAF	62%

CALIFORNIA DEPARTMENT OF WATER RESOURCES

Presented on behalf of the Feather River Recovery Alliance

SNOWMELT DURING 2017 OROVILLE DAM SPILLWAYS INCIDENT

Center for Western Weather and Water Extremes, Brian Henn

Extreme Runoff Generation From Atmospheric River Driven Snowmelt During the 2017 Oroville Dam Spillways Incident

Brian Henn[1,2], Keith N. Musselman[3], Leanne Lestak[3], F. Martin Ralph[1], and Noah P. Molotch[3,4]

[1]Center for Western Weather and Water Extremes, University of California San Diego, La Jolla, CA, USA, [2]Vulcan Climate Modeling, Vulcan, Inc., Seattle, WA, USA, [3]Institute of Arctic and Alpine Research, University of Colorado Boulder, Boulder, CO, USA, [4]Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA

Abstract In February 2017, a 5-day sequence of atmospheric river storms in California, USA, resulted in extreme inflows to Lake Oroville, the state's second-largest reservoir. Damage to the reservoir's spillway infrastructure necessitated evacuation of 188,000 people; subsequent infrastructure repairs cost $1 billion. We assess the atmospheric conditions, snowmelt, and runoff against major historical events. The event generated exceptional runoff volumes (second largest in a 30-yr record) partially at odds with the event precipitation totals (ninth largest). We explain the discrepancy with observed record melt of deep antecedent snowpack, heavy rainfall extending to unusually high elevations, and high water vapor transport during the atmospheric river storms. An analysis of distributed snow water equivalent indicates that snowmelt increased water available for runoff watershed-wide by 37% (25–52% at 90% confidence). The results highlight potential threats to public safety and infrastructure associated with a warmer and more variable climate.

Plain Language Summary In February 2017, extreme runoff into California's second-largest reservoir, Lake Oroville, and cracks in the reservoir's spillways resulted in evacuations of thousands of people and major repair costs. We analyzed to what extent the atmospheric river storms that caused the extreme runoff were unusual in terms of precipitation, snowmelt, temperature, and moisture in the air. We found that the precipitation amounts were less unusual than the runoff amounts, suggesting that other factors were involved. We also found that snowmelt in the Sierra Nevada mountains above the reservoir was the heaviest on record at many locations, driven by unusually warm temperatures and deep preexisting snowpack before the storms began. Thus, the warm temperatures and record melt likely increased the water available for runoff by about a third during the spillways incident. Our findings are consistent with other studies that suggest that unusually warm temperatures during winter atmospheric river storms in the Western United States are associated with flood risk due to substantial rainfall and snowmelt. Other studies show that climate change is expected to increase the type of flood risk in the 2017 incident.

- An analysis of distributed snow water equivalency indicates that snow melt increased water available for run off - watershed wide by 37%
- Currently snow melt is not being considered in sizing of the variable FIRO flood pool
- Forecasted reservoir releases could be 37% higher on already reduced flood pool

Presented on behalf of the Feather River Recovery Alliance

YUBA-FEATHER FORECAST INFORMED RESERVOIR OPERATIONS (FIRO)
Inflow Forecast vs Observation

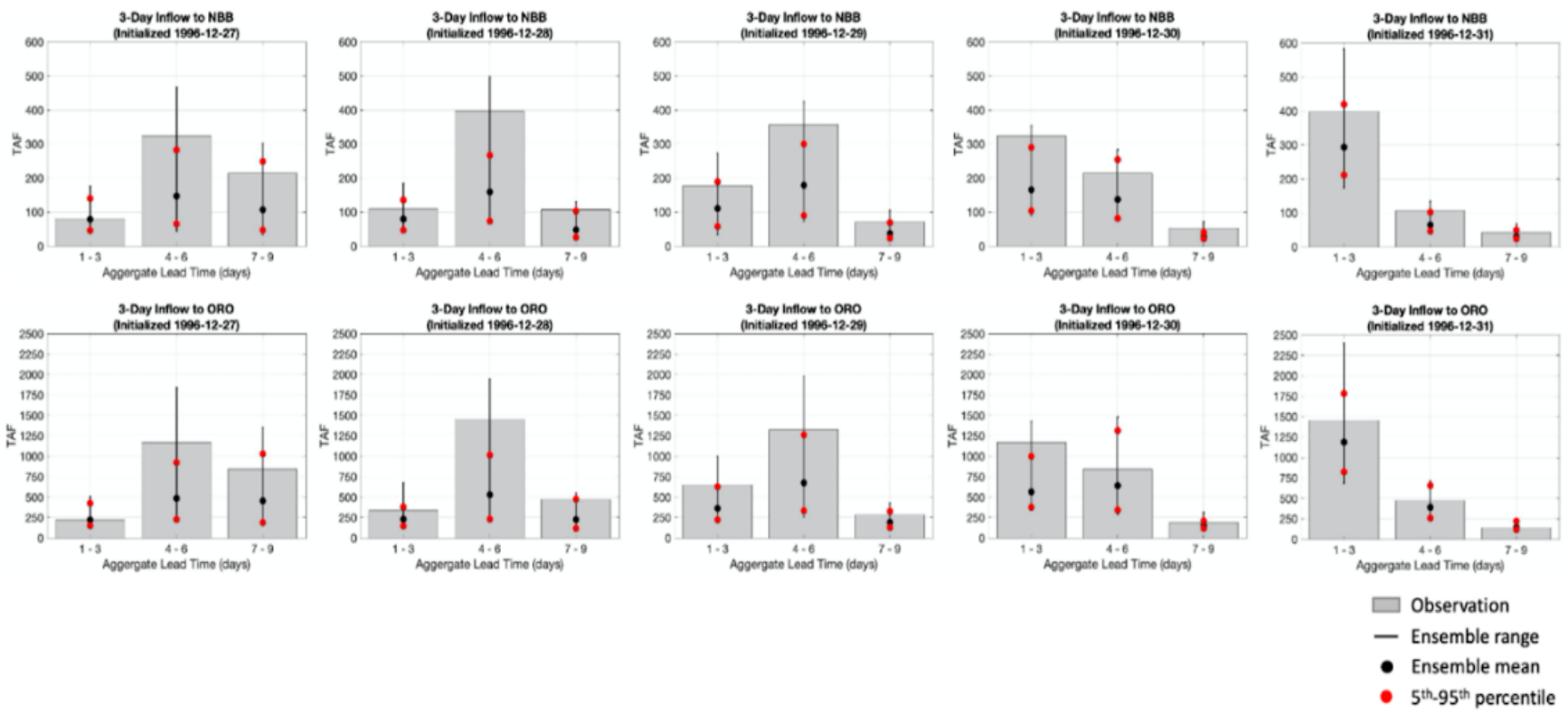


Figure P-12. *72-hour (3-day) ensemble full-natural inflow forecasts (lines and dots) and observations (bars) at NBB (top) and ORO (bottom) reservoirs in thousand acre-feet (TAF), aggregated for lead times 1-3, 4-6, and 7-9 lead days, shown for initialization dates 27-31 December 1997 (left-right). Note the difference in y-axis scales between NBB and ORO.*

Forecast Error Rate Percent	
1-3 days	**-23% to +16%**
4-6 days	-50% to +15%
7-9 days	-60% to +12%

Presented on behalf of the Feather River Recovery Alliance

YUBA-FEATHER FORECAST INFORMED RESERVOIR OPERATIONS (FIRO)
EFO Models Results for 110% Scaled 1986 Event at Oroville

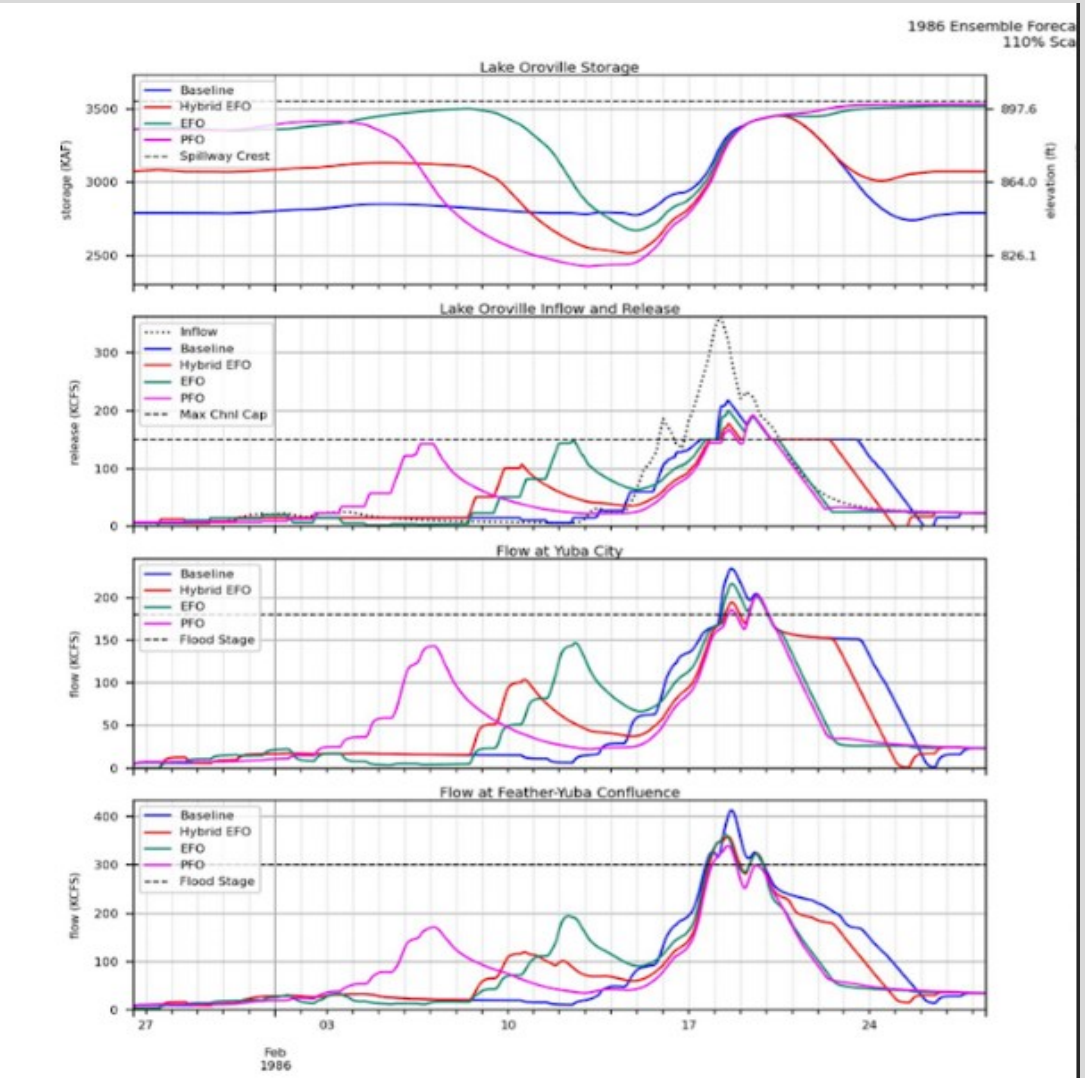


Figure G-16. *EFO Model results for 110% scaled 1986 flood event.*

- Pre-releases starting 10 to 11 days out
- Exceeds downstream constraints
- Snow melt contribution questionable
- Local tributary inflows questionable

Presented on behalf of the Feather River Recovery Alliance

YUBA-FEATHER FORECAST INFORMED RESERVOIR OPERATIONS (FIRO)
Economic Benefits

R.1 Yuba-Feather FIRO Economic Benefits

Multipurpose reservoirs provide quantifiable economic benefits that include water supply reliability during dry periods, flood damage risk reduction during wet periods, recreation, navigation, hydropower, ecological benefits, and climate resilience (Klemeš 1977, Datta and Burges 1984, Graham and Georgakakos 2010).

Flood damage risk reduction benefits can be described in terms of reductions in expected annual damage (EAD) and expected annual loss of life (EALL). Changes to EAD and EALL associated with flooding in the Yuba-Feather system can be estimated for the FIRO preferred alternative relative to existing operations. To quantify the potential economic benefits, downstream stage-frequency curves associated with the FIRO preferred alternative can be used as inputs to the US Army Corps HEC-FDA (Flood Damage Reduction Assessment) model, which has previously been configured for use in the Yuba-Feather watersheds (YCWA, 2018; DWR, 2017).

The Yuba Water (2018) assessment evaluated three flood risk management improvement actions, including the preferred alternative of Forecast-Informed Operations (F-IO) at Lake Oroville and New Bullards Bar combined with the construction of a second spillway at New Bullards Bar. The preferred alternative was predicted to reduce expected annual damage (EAD) from $35.8 million to $22.3 million, a net with-project inundation reduction benefit of $13.6 million (dollar values in 2016 dollars). EAD under without-project and with-project conditions was estimated using HEC-FDA over 11 impact areas consistent with the 2017 CVFPP Update. Expected damage reduction benefits were determined for: direct damages to structures/content, crops, highways and streets, and vehicles; other costs comprising business losses, emergency response costs, and displacement and temporary housing; and statistical lives lost. A similar approach can be used to evaluate the economic value of flood damage risk reduction for the FIRO FVA.

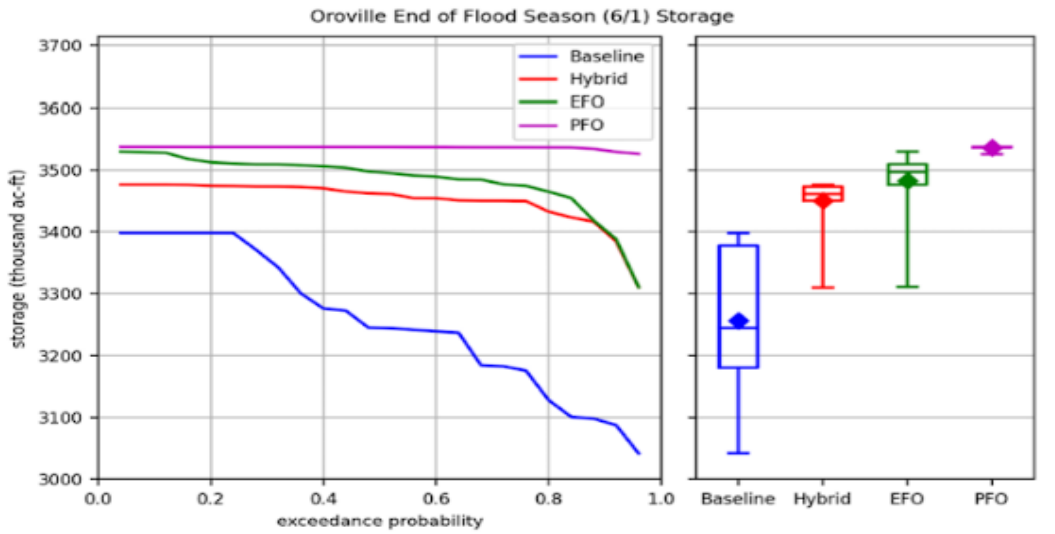
The valuation of water supply reliability involves distinctions between private and social, long-run and short-run, at-site and at-source, per-period and capitalized, and use and nonuse values (Young and Loomis, 2014). One simple metric of the private, short-run, at-site, per period, use value of water in the Yuba-Feather watersheds is the cost of water delivery, or unit water charge, for the Feather River Area which is estimated at $538 per acre foot in 2022 dollars ($493 in 2019 dollars, DWR Bulletin 132-18, p. 297). The combined capacity of Lake Oroville and New Bullards Bar is over 4.5 million acre-feet. Improvements to dry season water supply reliability could generate appreciable value. Period-of-record simulations of FIRO alternatives over winter periods can be used to generate estimates of the value of additional water available in the spring by applying unit water charges for the Feather River area (DWR, 2018).

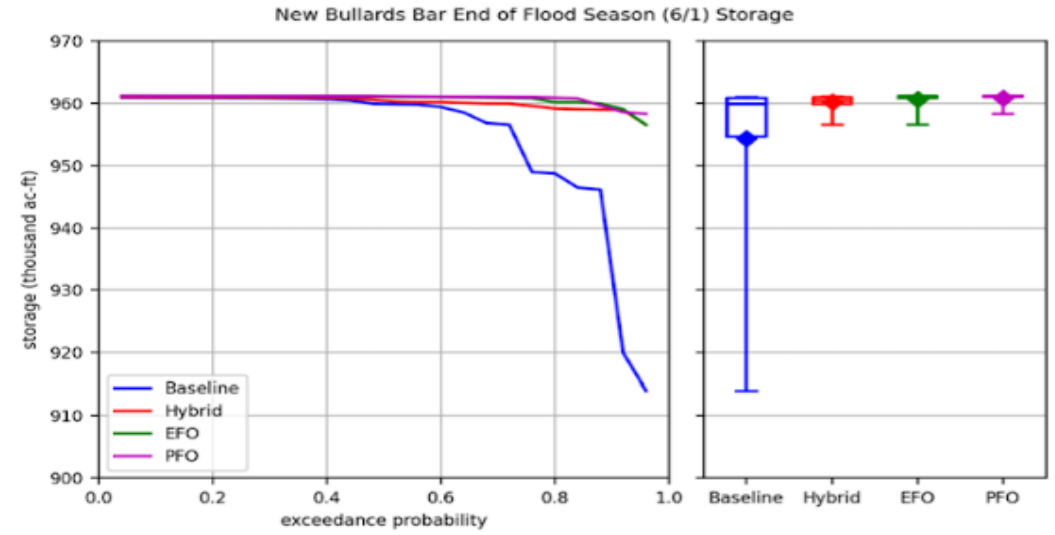
A Yuba water 2018 assessment predicted the preferred alternative FIRO operation would reduce expected annual damage (EAD) by $13.6 million

Presented on behalf of the Feather River Recovery Alliance

YUBA-FEATHER FORECAST INFORMED RESERVOIR OPERATIONS (FIRO)
End of Season Storage Gains From WCP Alternatives

Figure L-8. *Frequency of end of flood season storage for ORO (top) and NBB (bottom) as a function of WCP alternative.*





Alternative Plan	Storage Benefit
EFO-Hybrid to Baseline	200,000 AF
EFO to Baseline	220,000 AF

*Estimated value of stored water $1000/AF
200,000 AF x $1000 = $200M annual benefit

Presented on behalf of the Feather River Recovery Alliance

YUBA-FEATHER FORECAST INFORMED RESERVOIR OPERATIONS (FIRO)
FIRO PVA Recommendations

Section 8. Findings and Recommendations

8.1 Overall Summary of PVA Findings

The findings from this PVA are detailed in each section of this document and provide foundational support for the PVA recommendations. Overall, the PVA demonstrated that current forecast skill can support FIRO and that forecasts of atmospheric rivers (ARs) are essential for FIRO operations in the Yuba-Feather watersheds. Several scientific studies, and the continuation of the AR Recon program, are central to improving AR forecast skill and thus achieving greater benefits in meeting FIRO objectives. The preliminary assessment of FIRO alternatives uncovered complexities that will need to be further assessed in the Final Viability Assessment (FVA) to ensure that the alternative strategies can be objectively compared. Alternatives will also be assessed with and without the assumption that the Atmospheric River Control (ARC) Spillway is in place at NBB. Once the preferred FIRO alternative is identified, it will be conditionally operationalized by integrating FIRO parameters into the existing Forecast-Coordinated Operations (F-CO) decision support system for testing and evaluation. Importantly, both this PVA and the forthcoming FVA are sequenced with the Water Control Manual updates for NBB and ORO. These parallel efforts will continue to be closely coordinated to ensure alignment and timely implementation of FIRO.

Water Resources Engineering

These recommendations are drawn from Sections 4 and 5 of the PVA.

- WRE 1: Apply additional rigor to the consistent application of at-site and system constraints, data, hindcasts, and initial starting conditions as defined in the hydraulic engineering management plan to ensure the evaluated alternatives can be objectively compared.
- WRE 2: More directly assess the potential impact (positive or negative) on water supply and an economic benefits assessment. (Full period-of-record simulations should be made for all alternatives.)
- WRE 3: Leverage hindcasts generated using the current GEFSv12 model.
- WRE 4: Consider using synthetically generated ensemble hindcasts to enhance the robustness testing of the alternatives under consideration.
- WRE 5: Investigate objective forecast-informed methods for dynamically coordinating releases to meet the downstream flow objectives at Yuba City and below the Bear River, including developing appropriate metrics for evaluation.
- WRE 6: Evaluate at-site and system performance with and without the ARC Spillway to address Water Control Manual (WCM) update and/or planned deviation needs before construction of the spillway is complete (~2028).
- WRE 7: Further develop concepts for refining system operation. As demonstrated in the PVA results, refinement of the system operation may enhance flood risk management performance.

Due to the omission of certain data in the Preliminary Viability Assessments (PVA), many recommendations were made for the final viability assessment.

A rigorous audit of the final viability assessment should be conducted to ensure all such omissions have been addressed.

Presented on behalf of the Feather River Recovery Alliance

YUBA-FEATHER FORECAST INFORMED RESERVOIR OPERATIONS (FIRO)
Operation Rules for Reservoir Simulations in Decision Support System

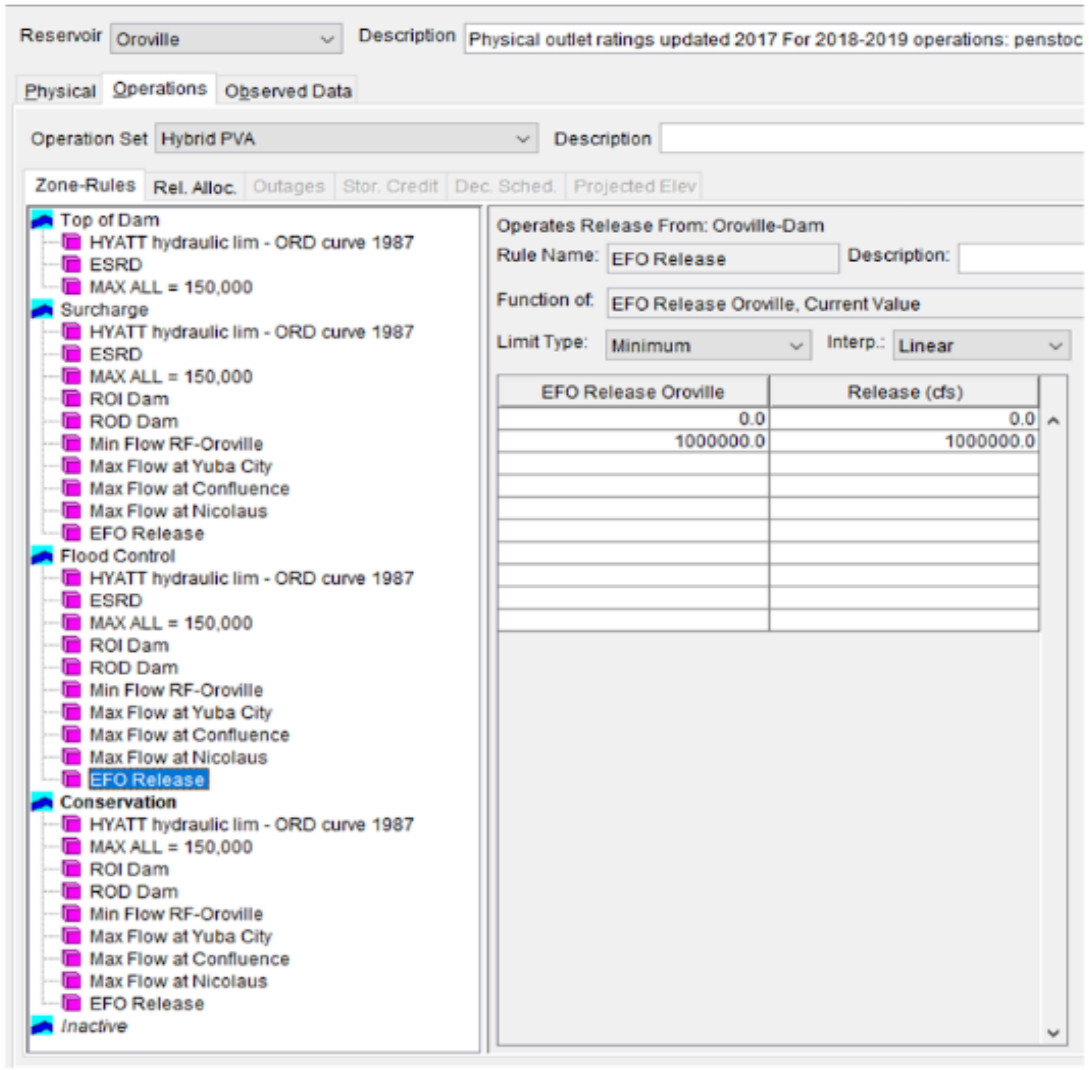


Figure G3-1. Oroville: Hybrid PVA Operation Set Screenshot

Operating rules within decision support system that create reservoir simulations can be individually turned on and off. Hopefully, new ones can be created that address such factors as levee risk and frequency of community evacuations.

Presented on behalf of the Feather River Recovery Alliance

MEETING 19 AGENDA

PROPOSED TOPICS

FEEDBACK DUE DATES

- CNRA will circulate proposed Action Item Tracker updates and proposed Meeting 19 Agenda by December 20
- Commissioner feedback January 10

ITEM 6
PUBLIC COMMENT

The Oroville Dam Citizens Advisory Commission will now take public comment.

We appreciate your input.

ITEM 7
ADJOURN

Commission Meeting #19

March 7, 2025